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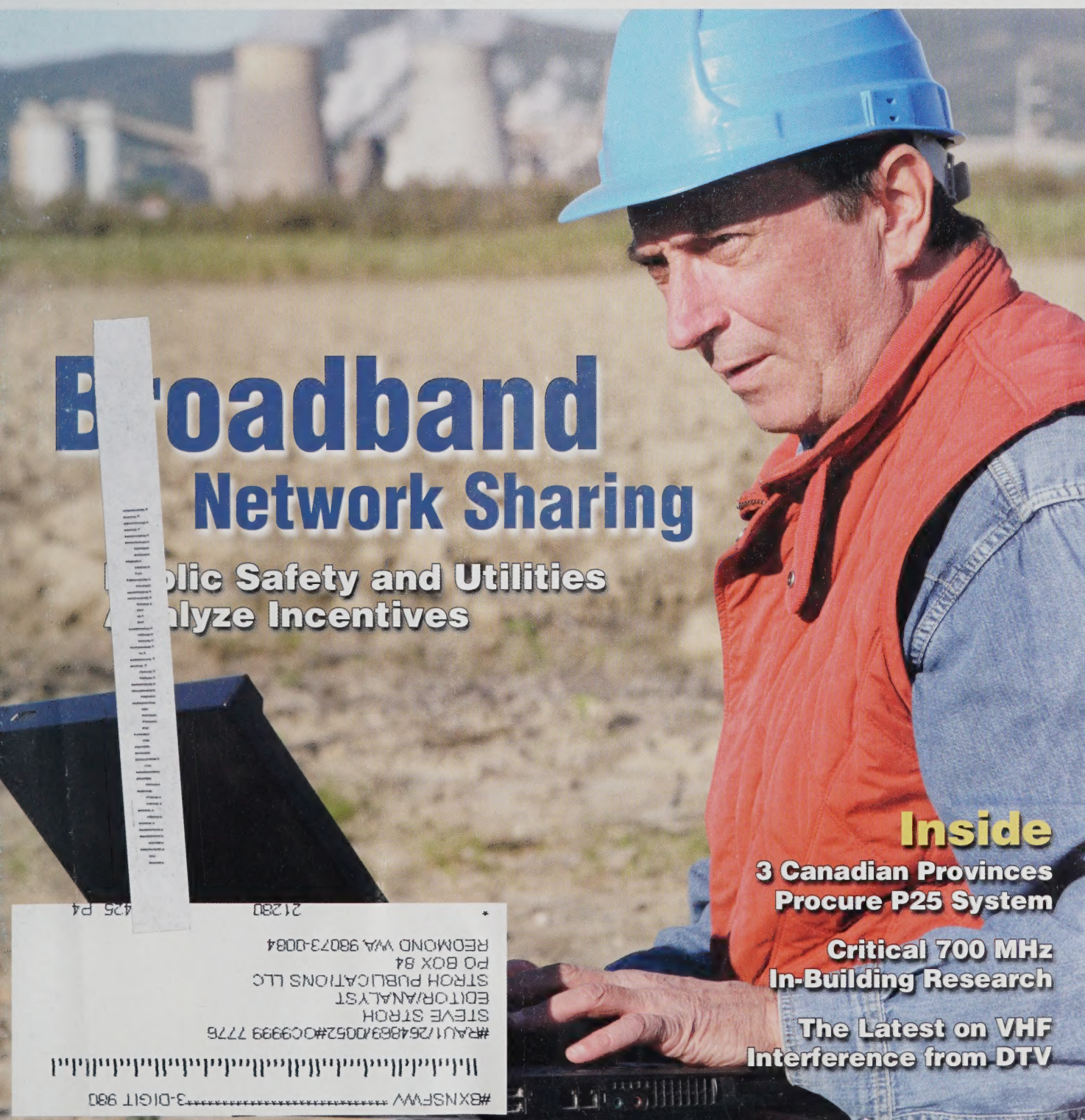

## Broadband Network Sharing

### Public Safety and Utilities Analyze Incentives

## Inside

**3 Canadian Provinces Procure P25 System**

**Critical 700 MHz In-Building Research**

**The Latest on VHF Interference from DTV**

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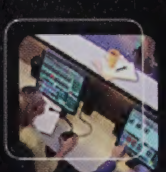

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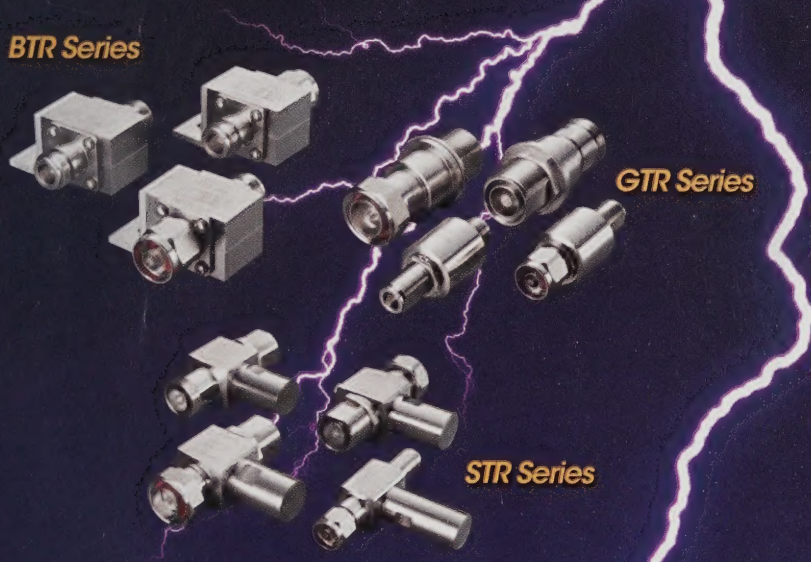


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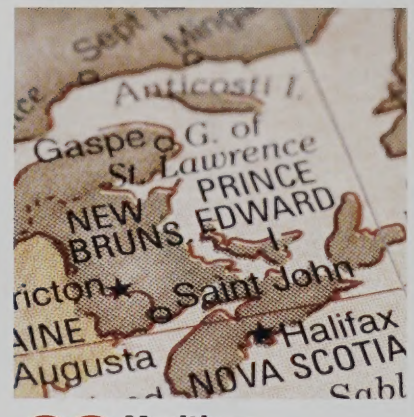


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# Inbox

Following are comments we've received from readers about recent print articles and news from TRANSMISSION, a weekly e-mail newsletter. Submit comments to editor@RRMediaGroup.com.

### Microwave Features and Benefits

**Editor:**

I would like to comment on Amir Zoufonoun's suggestion in the "Microwave Strengthens Backhaul" in the March issue that an embedded spectrum analyzer should be included. I would debate the necessity of such a feature in the license band. These frequencies are coordinated to eliminate the issue of interference. The other benefit a license holder has is the guarantee of interference resolution.

My last comment is with his explanation of "actual over the air rate" versus actual throughput. The definition of throughput varies from vendor to vendor depending on the type of compression technique. So I feel that he should have explained "actual user line rate" versus actual radio payload data rate. Many radio vendors are using user line rates as their actual throughput figures on their datasheets.

*Bob Lowell*
*NEC Corp. of America*

### Motorola UHF Request

**Editor:**

In response to "FCC Seeks Comment on Motorola Low-Power 450 – 470 MHz Request," we mustn't allow Motorola to change the standard. Just look at the mess we have in VHF. We already suffer from unlicensed low-power units programmed on input channels to high-power repeaters. If the split is changed, it will only come back to bite us later.

I'm sure Motorola has some sleazy plan up its sleeves that we will all regret later. I would be of the same mindset if it were any other manufacturer asking to do the same. Please leave the UHF spectrum alone.

*Arnold Koerber*
*Concept Communications*

**Editor:**

There was a reason this standard was established for 450 – 470. VHF became a mess of channels all over the spectrum, and combining systems became expensive and sometimes impossible to build. Injection of non-standard splits into this spectrum would create who knows how much interference to channels already struggling with unwanted RF interference.

It works well just the way it is, and I am suspicious of the ulterior motives of any large manufacturer wanting to change something that works so well.

*Bill Kidd*
*Kidd Communications*

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# Spring Online Expo

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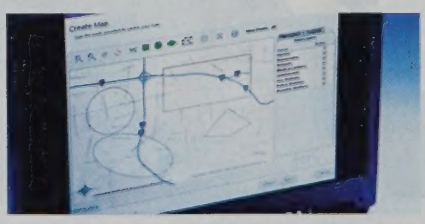
### Paging Auction

An update on the paging auction, which begins in June.

### Broadband



The latest broadband developments for public-safety entities.

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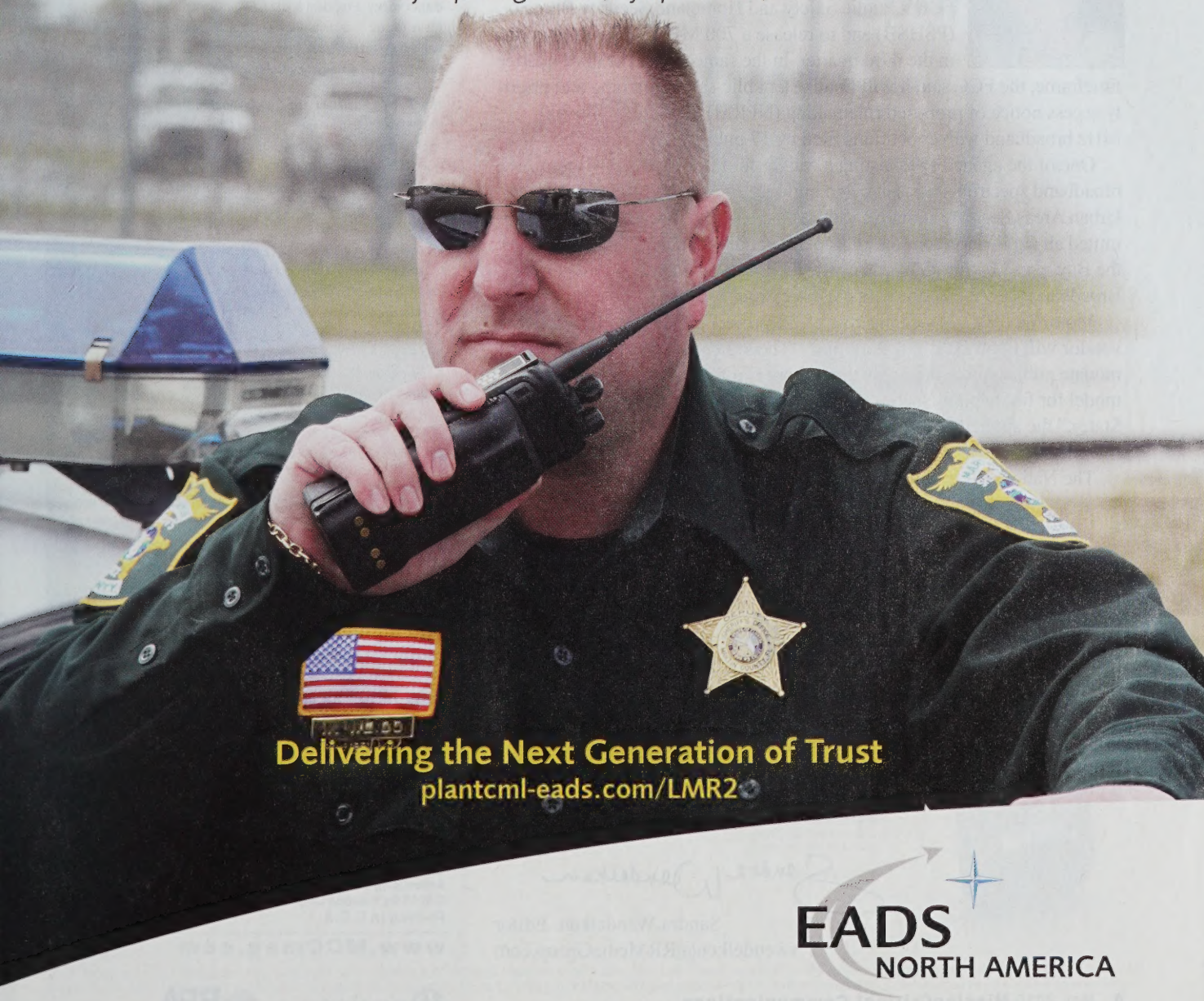

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# Broadband Initiatives Move Forward

Since the FCC released its national broadband plan in March, several items have moved steadily forward. The FCC established an action plan and timetables, including several public-safety items. Now we have deadlines to which we can hold the commission — although pushing back deadlines is not unheard of at the FCC. In fact, the national broadband plan itself was about a month late to Congress.

Specifically, the FCC will release a D block order in late quarter two or early quarter three and hold a D block auction in the first half of 2011. In the second quarter, it plans an order creating an Emergency Response Interoperability Center (ERIC) within the FCC's Public Safety and Homeland Security Bureau (PSHSB) and to release a 700 MHz public-safety order in the third quarter. In the same second or third quarter timeframe, the FCC said it will finalize a public-safety roaming and priority access notice of proposed rulemaking (NPRM) and rule on the 700 MHz broadband waiver petitions filed by 17 public-safety agencies.

One of the agencies requesting a waiver for the 700 MHz public-safety broadband spectrum so it can begin building a network is the Bay Area Urban Areas Security Initiative (UASI). Separately, in April Motorola submitted an application for $50 million in federal broadband funds to help the Bay Area UASI build and operate the Bay Area Wireless Enhanced Broadband (BayWEB) for which it's seeking a waiver.

Motorola officials said the cost of the project is $72.5 million, and the vendor will contribute $21.9 million. "The system is scalable to accommodate public-safety networks throughout California and can serve as a model for future public-safety broadband buildouts throughout the United States," the application said. Motorola also said the company will have a roaming agreement with Verizon Wireless.

The National Telecommunications and Information Administration (NTIA) plans to award all the broadband funds by September. If Motorola is awarded the grant, how will that play out for the other public-safety agencies and vendors planning broadband networks?

**We value your opinions! Please e-mail your feedback to me at swendelken@RRMediaGroup.com.**

Also in April, the Public Safety Communications Research (PSCR) held the first face-to-face meetings for its 700 MHz broadband demonstration network for public safety. The meetings set the formal project plan, project expectations and application requirements for the network, which will be tested at sites in Boulder, Colo., and Washington.

Sandra Wendelken

Sandra Wendelken, Editor
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REGULATORY

# Legislation Process Begins for Nationwide Public-Safety Network

*By Michelle Zilis*

The nationwide public-safety network gained momentum after a promising House subcommittee hearing on the FCC's broadband plan March 25. The oversight hearing included all five FCC officials and the House Subcommittee on Communications, Technology and the Internet.

Many of the subcommittee members expressed support for the buildout and called it "long overdue." Subcommittee Chairman Rep. Rick Boucher offered his support for additional funding for the provision, and Rep. Henry Waxman said he and Boucher would begin drafting legislation to appropriate most if not all of the D block auction proceeds to help pay for the $6.5 million starting costs of the project.

Within the nationwide broadband plan, the FCC called for the D block to be auctioned to the private sector. The proceeds raised from the auction would then help fund the public-safety nationwide interoperability network. In addition, the plan recommended that Congress consider significant public funding — $12 billion to $16 billion over 10 years — for the network, which would use the already dedicated 10 megahertz of broadband spectrum in partnership with private carriers. The D block auction winners and owners of other 700 MHz spectrum would be required to provide roaming access at reasonable rates and give public safety priority access.

The FCC's recommendations include creating a $6 billion federal grant program to help support network construction and additional funding for operation of the broadband network. Another $6 billion to $10 billion would cover operation of the network over 10 years and to upgrade the network as technology advances.

It's important to move forward with the buildout now while the 4G commercial networks are being rolled out because doing so jointly would be the least expensive way to build the public-safety network, said FCC Chairman Julius Genachowski. After Boucher asked Genachowski if congressional legislation would be needed to devote the auction proceeds to the buildout, Boucher said he would begin drafting legislation to do just that. Rep. Bart Stupak agreed, and in his opening statement said that 100 percent of the D block funds should be used as a down payment for the buildout. A long-term funding mechanism should come from Congress, Stupak said.

Several subcommittee members asked what was considered while drafting the plan and if the commissioners believed 10 megahertz of dedicated spectrum would be enough for public safety.

Genachowski said the FCC staff believes the overall plan delivers on 9/11 Commission Report recommendations. He also said the 10 megahertz is enough spectrum now, but acknowledged that additional spectrum could be needed in the future. All five FCC members agreed that the approach outlined in the plan was the best way to go about the buildout.

More details for the plan, including information on roaming and priority access requirements for carriers, will be addressed during the rulemaking phase. The FCC team is confident that they will have ready and willing loyal partners across the country for the network, Genachowski said. The FCC staff is currently working on an implementation schedule.

The plan also includes a working recommendation that Congress appropriate funding for the National Highway and Traffic Safety Administration (NHTSA) to analyze the cost of deploying a next-generation 9-1-1 (NG 9-1-1) nationwide system. In addition, the plan addressed cyber security and critical communications infrastructure protection and improving the nation's emergency alerting system (EAS).

## E9-1-1 Caucus Introduces Legislation to Fund 9-1-1

The Congressional E9-1-1 Caucus introduced legislation to upgrade U.S. 9-1-1 call center technology nationwide. The Next Generation 9-1-1 Preservation Act of 2010 would reauthorize grants and programs to ensure continued funding for the nation's 6,000 9-1-1 centers and programs.

The proposed bill reauthorizes a five-year federal grant program to support state 9-1-1 services and improve technology. It also introduces improvements to the national E9-1-1 Implementation Coordination Office (ICO), which helps states upgrade technology and coordinate services between call centers.

Some states have a history of diverting their 9-1-1 funds to support other programs. The Next Generation 9-1-1 Preservation Act prevents states that divert funds from receiving the grants in the legislation.

"This bill makes certain that 9-1-1 funds actually go toward funding 9-1-1 call centers," Co-Chair Rep. Anna Eshoo said. "We need to make certain that the funds are used for the purpose that they are intended if we want to maintain our emergency call centers."

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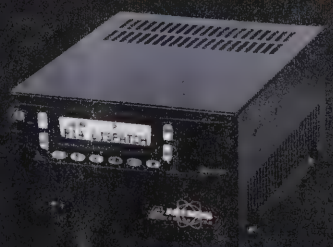

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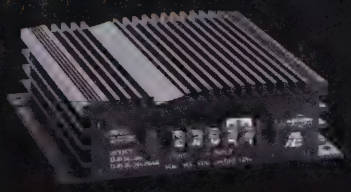

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# News Briefs

## FCC Seeks Comment on 450 – 470 MHz Request

The FCC is seeking comment on a Motorola request for interpretation or waiver of Section 90.267 of the commission's rules. Reply comments are due May 4.

In March, Motorola sought a declaratory ruling that low-power systems authorized pursuant to Section 90.267 are not subject to the requirement in Section 90.173(i) of the commission's rules of a standard 5-megahertz separation between paired 450 – 470 MHz band base and mobile frequencies. Motorola argued that the standard separation applies only to the "primary" frequencies in the band spaced 25 kilohertz apart and not to "offset" frequencies between them, including the low-power frequencies in Section 90.267.

In the event that the rules are interpreted to require the standard 5-megahertz separation for low-power frequencies, Motorola requested a blanket waiver of that requirement with respect to applications for low-power operations that are submitted pursuant to Section 90.267. Motorola said a waiver would serve the public interest by promoting more effective use of spectrum, facilitating the deployment of low-power repeaters with nonstandard separation to avoid the occurrence of intermodulation interference when multiple repeater cells are used within close proximity.

## NPSTC Petitions on 700 MHz Air to Ground

The National Public Safety Telecommunications Council (NPSTC) petitioned the FCC to amend the applicable provisions of Subpart R of the Part 90 rules to allow secondary noninteroperability aircraft voice operations on certain interoperability channels subject to state approval. The petition further requests the commission to either amend Part 90.531 to allow the use of certain interoperability channels separately from the channels listed in 90.531 or clarify that the channels listed in Part 90.531 can be operated separately as 12.5-kilohertz wide channels for secondary trunking or air-to-ground voice use in compliance with Part 90.548.

NPSTC recommended that transmissions in 700 MHz be limited to 2 watts as found in Part 90.541(d). NPSTC, at the request of the state of Maryland, considered voice operation with air-to-ground communications for public safety and found that systems using primarily trunked operations on state 700 MHz channels or general pool 700 MHz channels have problems with aircraft trying to operate without rendering

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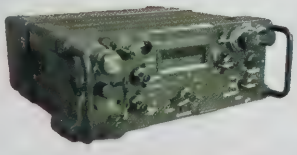

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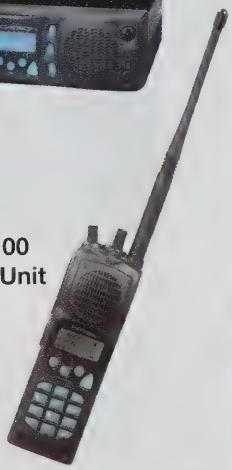

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interference to distant systems. NPSTC said Maryland is not unique in the problem, and it is a nationwide issue affecting all licensees operating aircraft radios in the 700 MHz band.

The petition said most systems are being constructed using Project 25 (P25) technology employing one voice slot with a 12.5-kilohertz channel width and potentially migrating to two voice slots in 12.5-kilohertz technology following adoption of the P25 Phase 2 standard. If the channels found in Part 90.531(b)(7) can only be used with the adjacent channels found in Part 90.531(b)(1)(iii) to form a 25-kilohertz wide channel, then this spectrum is likely to be orphaned and unused in most cases. Therefore, greater spectrum use would be possible with the added flexibility to use as separated 12.5-kilohertz wide channels, the petition said.

### AAA Certified as Frequency Coordinator

The FCC certified the American Automobile Association (AAA) to coordinate business/industrial/land transportation pool frequencies in the 806 – 816/851 – 861 MHz and 896 – 901/935 – 940 MHz bands. The decision follows a comment period during which three comments and one reply were received, mostly in support of the request.

AAA filed its request for frequency coordination certification last year.

### Motorola Unveils New Channel Partner Program

Motorola unveiled a new program for its channel partners called the Motorola PartnerEmpower Program, which brings together all enterprise mobility solutions (EMS) partners, including two-way radio dealers, under a single channel program framework.

The introduction follows the integration of Motorola's enterprise mobility business and government and public-safety business into the EMS business in early 2009. PartnerEmpower will comprise three program tracks reflecting Motorola EMS' three core technology areas — wireless network solutions, mobility and radio. These tracks will be rolled out in stages during the next 18 months, and existing channel partners will be gradually transitioned into the appropriate track without business interruption. In the meantime, existing programs will remain unchanged.

"When (mobile radio channel partners) want to expand their portfolios beyond radios to WLAN because a lot of their customers are looking for it, they can invest and get certified to sell WLAN or figure out who they should partner with to sell that solution," said Mark Kroh, vice president of North America channels, Motorola EMS. "Our message is to deliver an expanded portfolio and figure out who to partner with."

Kroh said Motorola is also rolling out a dealer registration program at the end of 2010 for its two-way radio partners. "This allows us to ensure the business goes where the value is created," he said. "For a channel partner working on a deal for months and the customer comes out with a request for proposals (RFP), that partner will generate a certain level of preference in terms of pricing. It creates an incentive to be in front. They will have pricing or support and other benefits awarded them."

### SkyTerra Gains Terrestrial Network Component Approval

The FCC granted SkyTerra's application for a modification of certain terms of its ancillary terrestrial component (ATC) authorization. This

BUSINESS

## DMR Association Announces Interoperability Tests, New Members

The Digital Mobile Radio (DMR) Association announced the first DMR interoperability test session will take place in Milan, Italy, the week of April 26.

The announcement follows progress defining a list of interoperability tests, suitable test methodology, testing laboratory criteria and a test result verification process for both conventional and trunked modes of operation. The test session will complete phase one of the DMR Association's interoperability program.

The test process also includes the work of the European Telecommunications Standards Institute (ETSI) special task force (STF) during the DMR standardization process from 2004 and 2006, to define test criteria formalized in the documents TS 102 362-1, 2 and 3. The association will provide certifications for equipment that successfully passes the testing process, which will be made public on the association Web site.

Separately, Hytera became the second company to offer DMR equipment in North America, with the launch of a new DMR line of products in March. The line includes a portable radio (PD782), mobile radio (MD782) and a repeater (RD982). Hytera, headquartered in Shenzhen, China, has been developing and promoting digital products since 2003.

*Hytera is the second vendor to offer DMR products in North America.*

Motorola is the only other vendor to offer DMR products in North America, although Tait Electronics and Vertex Standard have announced plans for DMR product lines. Vertex Standard said its new digital radio series will emerge later in 2010 with a new portable, mobile and repeater. The radios will operate in analog or digital mode without future software upgrades required.

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# Digital Mobile Radio Revenues to Increase 112% in 2013

Revenues of mobile radios based on digital technologies such as Project 25 (P25), Digital Mobile Radio (DMR) and NXDN are expected to increase 112 percent through end-2013 in North America, according to a market research firm.

"This year marks the entrance of a second tranche of DMR manufacturers, with HYT America's new Hytera DMR offering," said Jatinder Thandi, a research analyst with IMS Research. "More competition in the DMR market will inevitably lower prices and provide greater choice, which will benefit end users."

In addition to DMR, Kenwood's NEXEDGE and Icom's Idas technologies have made large dents in the analog installed base in 2009, particularly in the business and industrial sectors. "Over the next five years, the low-cost digital installed base will be measured in the millions worldwide," Thandi said. "Lower-priced DMR and NXDN-based systems have removed the barrier of cost, and the large base of LMR users outside of first responders have begun to move to digital en masse."

The P25 market is also expected to increase during the next few years, driven by decreasing prices of Phase 1 equipment in the VHF/UHF bands. As the Jan. 1, 2013, narrowbanding deadline approaches, shipments are expected to spike. However, the future of 700 MHz narrowband voice networks remains unclear, IMS analysts said. Thirty-two of the 55 regional planning committee (RPC) plans have been approved. However, the availability of P25 Phase 2-compatible equipment remains an issue. In addition, the expected high price of Phase 2 equipment is forecast to delay these network rollouts.

IMS Research recently published "The World Market for Licensed Mobile Radio – 2010 Edition" and "The World Market for DMR/dPMR – 2010 Edition."

approval allows SkyTerra to implement its cooperative agreement with Inmarsat and deploy a terrestrial mobile broadband network, which will be integrated with SkyTerra's satellite network.

"The FCC said in the broadband plan that it wanted to accelerate efforts to make L-band usable for broadband ATC service," said Alexander H. Good, chairman, CEO and president of SkyTerra. "Approving our modification request makes it possible for us to provide a full measure of spectrum for mobile broadband."

Later this year, SkyTerra plans to launch the first of two satellites — expected to be among the largest and most powerful commercial satellites ever built, SkyTerra officials said — for coverage of the U.S. and Canada.

SkyTerra also received approval from the FCC for the transfer of control of the company to Harbinger. Under the previously announced merger agreement, SkyTerra was acquired by a new corporation formed and indirectly wholly owned by Harbinger Capital Partners Master Fund I and Harbinger Capital Partners Special Situations Fund.

In a filing with the FCC, Harbinger said it would use Long Term Evolution (LTE) technology, and the network will have no less than 23 megahertz of spectrum, consisting of 8 megahertz of 1.4 GHz terrestrial spectrum, access to 5 megahertz of 1.6 GHz terrestrial spectrum and 10 megahertz of mobile satellite services (MSS)/ATC L-band spectrum. Through a cooperation agreement with Inmarsat and associated waivers of the FCC's ATC rules, by 2013 Harbinger will have access to an additional 30 megahertz of ATC spectrum.

## P25 Vendors Partner on Interfaces and Testing

Several manufacturers announced Project 25 (P25)-related digital interfaces agreements and products.

Daniels Electronics and Telex Radio Dispatch developed a P25 DFSI between their products, enabling direct digital connection from the Daniels LMR radio to Telex dispatch consoles, in accordance with the TIA P25 Fixed Station Interface (FSI) standard.

The Telex DFSI, enabling direct digital connection from the Telex C-Soft dispatch console in accordance with the P25 FSI standard, will also be certified with Tait Radio Communications equipment. Daniels Electronics also developed with Catalyst Communications Technologies a second-generation IP digital interface between the two companies' products. This integrated solution provides new features including the P25 unit ID, P25 emergency indicator and satellite connectivity.

At press time, three vendors supplied the 13 Suppliers' Declarations of Compliance (SDoCs) for the P25 Compliance Assessment Program (CAP) available online. EF Johnson is the latest supplier to post SDoCs on the federal Responder Knowledge Base Web site. In addition to SDoCs for EF Johnson VHF and UHF mobile and portable radios, Harris mobile and portable radios at VHF, UHF and 800 MHz also have SDoCs, along with a Tait Electronics base station and mobile and portable radios.

## Harris Announces New Radio Manufacturing Site

Harris announced plans to develop a new manufacturing and logistics facility for the production of radio systems by its RF Communications business.

The plans call for the purchase of a 573,000-square-foot building in Henrietta, N.Y., from Xerox. A subsequent renovation will allow Harris to consolidate its manufacturing operations into a single site, improving efficiency, company officials said.

"Our manufacturing operations are housed in four separate locations," said Dana Mehnert, group president, Harris RF Communications. "In

# COVERAGE

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purchasing this building, along with the help of New York state and Monroe County, we will be streamlining our production, allowing us to bring new products to market more quickly and at a lower cost."

About half of Harris RF Communications' local workforce of 2,300 will relocate to the new facility with the balance remaining in Rochester. The move is scheduled to begin in the summer of 2011 after renovations are complete.

### DCC is Now PlantCML

PlantCML, an EADS North America company, consolidated its wholly owned subsidiary, Dialogic Communications Corp. (DCC) and its affiliated brands into one brand — PlantCML. The move folds DCC's notification solutions and services (NSS) into the company's security and communications portfolio, comprised of critical call center applications and Project 25 (P25) LMR networks.

DCC's office in Franklin, Tenn., will remain integral to serving clients ranging from public-safety operations to *Fortune* 1000 corporations to federal agencies. Led by Bob Freinberg, vice president and general manager, all NSS product development, technical support, field services and sales efforts will continue to be managed from this location.

### Federal Signal Completes Sirit Buy

Federal Signal completed its acquisition of Sirit. Federal Signal increased its purchase offer twice for the radio frequency identification (RFID) developer for a total equity value of about CDN$73 million (US$70 million).

With the buy, company officials said Federal Signal is well positioned to offer comprehensive intelligent transportation systems (ITS) solutions.

## PEOPLE

### Vasek Joins UTC

Donald Vasek joined the Utilities Telecom Council (UTC) as director of spectrum services. Vasek will manage the frequency coordination and license management services at the organization.

Vasek has more than 20 years of experience in land mobile frequency coordination. He replaces Klaus Bender in this function. Bender will focus on UTC's engineering services with a concentration on smart grid implementation and standards.

### Sheehan Named Thales CEO, President

Thales Communications

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appointed Michael Sheehan as CEO and president. Sheehan's appointment follows the planned retirement of Mitch Herbets, CEO and president of the business since 2000.

Michael Sheehan

Sheehan brings more than 27 years of industry experience to Thales. He most recently served as a senior executive with Cobham's Avionics business.

### Federal Signal Promotes Janek

Federal Signal appointed David Janek president of its safety and security systems group. Janek will be responsible for the company's law enforcement, communications, safety and security products manufactured and sold worldwide.

Janek joined Federal Signal in 2002 and most recently was vice president and corporate controller for the company.

### Intergraph Hires Robertson

Intergraph hired Jeff Robertson as vice president and general manager of its U.S. public-safety business unit. Robertson formerly was the executive director of the 911 Industry Alliance.

### Radio IP Hires Desgagné

Radio IP Software appointed Daniel Desgagné to the newly created position of chief operating officer (COO). Desgagné has more than 25 years of experience in executive management and leadership positions, in both domestic and overseas markets.

### Kiczuk Named CTO at Raytheon

Raytheon appointed William F. Kiczuk chief technology officer (CTO) and vice president. Kiczuk is a Raytheon senior principal engineering fellow with nearly 30 years' experience with the company.

### Datamaster Announces Krehbiel as President, CEO

Scott Krehbiel was promoted to president and CEO of Datamaster after serving for eight years as vice president and chief technology officer (CTO).

Babu Cherian takes over as vice president and CTO after leading development efforts for 10 years as vice president, research and development. Lyle Krehbiel assumes the roles of chairman and founder after a successful 17-year tenure as president and CEO.

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By Ralph A. Haller

# Watch for Interference from DTV Translators

It may seem odd that a magazine devoted to land mobile systems would spend time discussing digital TV (DTV) stations, but the issue is closer to home than many might think. When the FCC mandated the transition to DTV, it also reduced the effective radiated power (ERP) maximums. Analog VHF stations were permitted to have 316,000 watts ERP, and UHF stations could have 5 million watts ERP. But VHF DTV stations can run only 160,000 watts ERP, and UHF DTV stations are limited to 1 million watts ERP. These levels are further reduced with antenna heights more than 1,000 feet (305 meters) above average terrain.

As part of the transition to DTV, it was intended that analog stations would retain their existing service areas once in the digital mode. But especially for VHF stations, the mandatory power reductions often resulted in loss of service to areas that had quite acceptable analog signals. Attempting to combat this problem, the FCC adopted a report and order in May 2009 that allowed full-service TV stations to apply for TV translators (MB Docket 08-253, FCC Publication 09-36). Such translator stations receive the DTV station on its primary channel and rebroadcast it on another channel, similar to a land mobile repeater.

The translators are placed in poorly served geographic areas so that the TV programming can still be viewed. Translators can be licensed on TV channels 2 – 51.

The potential difficulty occurs in the 11 markets where TV channels 14 – 20 (T-band channels) are shared with land mobile use. TV stations are actively attempting to license numerous translators, many of which may be in the channel 14 – 20 range. As these translators go on the air, land mobile operations may experience interference ranging from a rise in the noise floor to noticeable degradation of land mobile signals.

Last year, the Land Mobile Communications Council (LMCC) asked the FCC not to accept DTV translator applications for channels 14 – 20 until the interference mechanism to land mobile systems could be better analyzed. The FCC hasn't acted on that request and has accepted and granted licenses for DTV translators in the T-band. This means that operators of land mobile systems in the T-band must now track proposed DTV translators that may affect their service areas. Interference suddenly appearing may also be an indication of a new DTV translator. If interference can be traced to a DTV translator, the FCC should be contacted immediately. For more information, see "Spectrum Monitor" in the August 2009 issue.

## Interesting Enforcement Actions

The county of Newton, Ark., was issued a notice of violation (NOV) on March 9 for digital transmissions. The license authorized only analog voice (F3E emissions). Any change in the emission type is considered a major change, which requires that the license also be modified. Licensees should assure that their licenses properly authorize their actual operations (enforcement case NOV V201032620002).

Even when licensed for digital operation, licensees can run into difficulties. On March 5 the Independent Taxi Owners Association was issued a NOV for failing to share its channel. The NOV reads, "At the time of the investigation, the station WQKD673, transmitter at 2050 Cyprian Drive, Los Angeles, was transmitting a digitally modulated continuous signal on 461.925 MHz, a frequency shared with other licensees in the Los Angeles area. These transmissions were without breaks for several hours, creating the potential for interference and preventing the effective sharing of the frequency with other licensed users." Most frequencies in the 150 – 174 and 450 – 470 MHz ranges are shared channels. Continuous transmissions aren't permitted. Channels should be monitored before transmitting, and sufficient off time must be made available for other co-channel users (enforcement case NOV 201032900009).

Most enforcement actions are taken against the licensee, but that isn't always the case. On Feb. 25, wireless dealer BearCom was issued a NOV for programming frequency 151.955 MHz into radios for use by Wal-Mart Superstore No. 3351 in Las Vegas. The Wal-Mart had no license for that channel. The NOV stated that Section 90.427(b) prohibits programming, into a transmitter, frequencies for which the licensee using the transmitter isn't authorized. This is one of the few times that the FCC fined an

equipment supplier for providing what would be considered legal equipment if properly licensed. Radio shops beware (enforcement case NOV V201032900008).

Extra capacity on a private microwave link may seem like a perfect opportunity to lease that excess capacity to another entity as a private carrier. But not all uses are permitted as Gila Electronics found out Jan. 27. Gila was fined $4,000 for, among other things, leasing its excess capacity to FM broadcast station KUKY (FM) for transmission of program material to its transmitter site. Unfortunately, the FCC rules don't permit private point-to-point microwave to serve as the final RF link in the chain of distribution of the program material to a broadcast station, which was the case. Had the link been an intermediate link, it would have been permitted under the rules. As the final link, the operation wasn't permitted. It isn't clear why the rules differentiate the final link, but the rules are the rules (enforcement case NAL/Acct 201032940002).

***Interference suddenly appearing may also be an indication of a new DTV translator. If interference can be traced to a DTV translator, the FCC should be contacted immediately.***

## Spectrum Dashboard

The FCC released a beta version of a new service that it calls Spectrum Dashboard. The service provides information on licensees and generates maps of service areas for various licensing databases. The dashboard allows users to browse spectrum by bands, search for spectrum licenses, produce maps of spectrum licenses and export raw licensing data. The initial release provides information about nonfederal spectrum use in the range of 225 MHz to 3.7 GHz. The FCC is encouraging use of the Web site and wants feedback on how Spectrum Dashboard can be improved. The link is http://reboot.fcc.gov/reform/systems/spectrum-dashboard. ■

Ralph A. Haller served as chief of the FCC's Private Radio Bureau for more than eight years. He is currently president of Fox Ridge Communications in Gettysburg, Pa. E-mail comments to editor@RRMediaGroup.com.

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# Broadband Network Sharing

Public safety and utilities are analyzing regulatory and financial incentives for broadband network construction and determining whether there could be a combined network.

By Klaus Bender

Broadband is the hot topic among communications policymakers, regulators and service providers inside and outside the Washington beltway. While pundits look to bolster the availability of broadband to the masses, two groups are tasked with determining requirements for internal broadband network connectivity for some of the most critical communications in the country. Public safety must refine its definition of high-speed connectivity and determine if existing allocations at 700 MHz are sufficient for a nationwide broadband first responder network. At the same time, first responders seek to define broadband requirements for the next two decades. And electric utilities in the United States are preparing to meet the goals of the smart grid, as mandated by Congress and the Obama administration. Broadband connectivity will play a critical role. Both groups are studying how to partner with commercial service providers.

Standards groups are forced to determine specific bandwidth requirements and what spectrum can accommodate the smart grid as the definition of the smart grid continues to evolve. Regulators suggest that both needs can be served by one network. Their proponents are struggling to determine how the developments will play out. First, we examine how we got here.

## National Broadband Plan

The FCC released its long-awaited national broadband plan (NBP) March 16 to much revelry and pontification. The more than 300-page document proposed sweeping reforms of communications policy to accelerate broadband deployment in the United States. The plan, mandated by Congress and funded by the American Recovery and Reinvestment Act (ARRA) of 2009, hopes to create a regulatory ecosystem that meets four statutory goals:

- Analyze the most effective and efficient mechanisms to ensure broadband access;
- Provide strategy for achieving affordability and use of such a service;
- Evaluate state of deployment; and
- Provide a plan for use of broadband infrastructure and services to serve national purposes, including education, health care, public safety, and energy independence and efficiency.

The FCC's interpretation of the congressional mandate led the agency

## More Information

- For more information on smart grid standardization efforts, see www.nist.gov/smartgrid.
- For information on how to participate in the NPSTC future spectrum project, visit www.npstc.org/pswac.jsp.

to develop specific goals for the plan: 100 million homes with wireless broadband access at speeds of 100 Megabits per second (Mbps) for download and 50 Mbps for upload, world leadership in deployed broadband connectivity, affordable broadband service available for purchase and at least 1 Gigabit per second (Gbps) broadband service to anchor institutions such as schools, hospitals and government buildings are the first four of the goals. These goals will be achieved by making 500 megahertz of licensed and unlicensed spectrum available during the next 10 years. The FCC will take a spectrum inventory of commercial, private and federal frequency use in an effort to identify underused swaths of bandwidth. The broadcasters could lose 120 megahertz of over-the-air TV channels, reducing the number of available broadcast channels by 20. Bands allocated for Wireless Communications Service (WCS) and Advanced Wireless Services (AWS) will come under scrutiny.

The FCC proposes to auction the 700 MHz D block with many of the previous public-safety sharing requirements removed. The FCC feels making this spectrum available will spur commercial providers into building the wireless broadband architecture to meet these goals. Subsidies and other solutions will be developed to assist low-income households to receive broadband service. The first three goals are achieved by freeing underused wireless spectrum for commercial carriers to provide broadband to a majority of Americans.

### Private Networks

While the first four goals in the NBP seek to provide broadband connectivity through publicly available resources and services, the FCC also acknowledges that private communications networks play vital roles in the safety and prosperity of all U.S. citizens. In its fifth goal, the FCC says, "to ensure the safety of Americans, every first responder should have access to a nationwide public-safety wireless network." First responders should be able to access critical voice, data and video information anywhere in the country, allowing access to advanced databases and video information that could prevent tragic public and first responder casualties. A nationwide broadband network that relies on an accepted, open-standard architecture will promote use by driving down infrastructure costs as manufacturers enter the market. There is spectrum available to construct the network, but government agencies have few funds available to invest in new wireless broadband infrastructure.

The commission acknowledges that "to ensure that America leads in the clean energy economy, every

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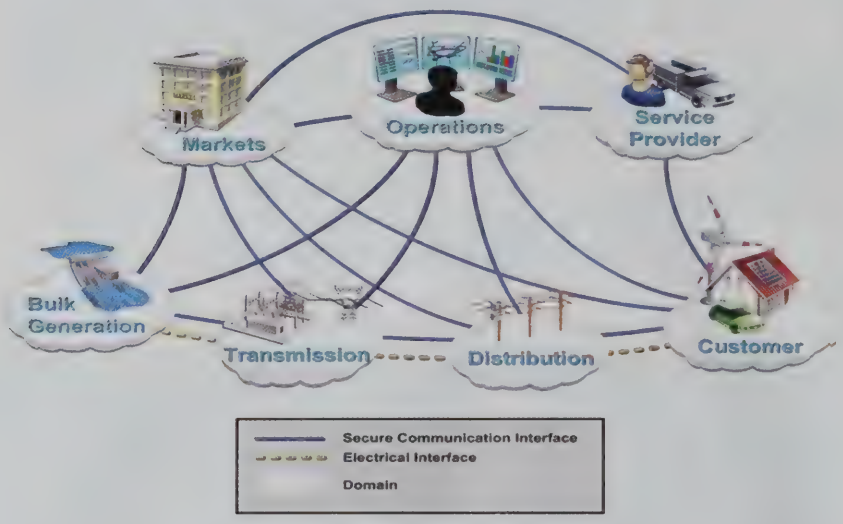
## NIST Conceptual Smart Grid Model




American should be able to use broadband to track and manage their real-time energy consumption." Broadband can help ensure two-way communications between energy providers and their customers. The FCC is referring to the smart grid, an effort to modernize U.S. electricity distribution by marrying advanced communications capabilities with utility infrastructure. Ideally, every device in the utility's generation, transmission and distribution system will be monitored and controlled by communications technologies. The FCC agrees that building a nationwide data network that relies on accepted open-standard architectures with a dedicated block of spectrum will promote the smart grid deployment by reducing infrastructure costs as manufacturers enter the market. Utilities have funds and infrastructure — tower, poles and such — but have no dedicated spectrum for a new wireless broadband network.

The FCC believes that public safety and the smart grid should rely, in part, on commercial wireless 3G and 4G services. The commission notes that wireless broadband deployments in urban areas offer many solutions needed by first responders. They point to public safety's acceptance of Long Term Evolution (LTE) communications protocols in the 700 MHz band as an opportunity for public safety to purchase services from carriers that have also standardized on LTE in adjacent blocks of spectrum. The FCC feels that certain noncritical utility data, such as meter reads, can be easily accommodated on carriers' 3G deployments. But the FCC concedes that the commercial interests of wireless carriers often don't align with the communications requirements of public safety and utilities. Reasons such as poor rural coverage, power backup deficiencies and lack of priority access for first responders are often cited.

The FCC NBP recommends that public safety build the 700 MHz broadband spectrum and auction the D block to fund some of the effort. Use of LTE technology will give public safety access to more spectrum by roaming onto commercial systems, potentially expanding geographic coverage, but at a cost to public-safety agencies. Public safety must now decide if 10 megahertz is enough dedicated broadband spectrum for the next 10 or 20 years and what applications can be trusted to run over the commercial networks and which should only ride on internal networks. Meanwhile, the FCC defers the discussion of smart grid broadband spectrum requirements and where the spectrum might come from to the departments of Energy and Commerce. Public safety and critical infrastructure need to determine how much spectrum is needed and whether it will be enough in 20 years.

**Utilities have funds and infrastructure — towers, poles and such — but have no dedicated spectrum for a new wireless broadband network.**

### The Smart Grid

Efforts to develop the smart grid date back to the IntelliGrid work done by the Electric Power Research Institute. Similar to the NBP, a congressional mandate spurred recent activity. The 2007 Energy Independence and Security Act identified the National Institute of Standards and Technology (NIST) as the government agency responsible for ensuring interoperability of smart-grid systems through the use of open standards. NIST approached the problem with a three-phase process. First, a series of workshops produced a draft interoperability roadmap for the smart grid, highlighting the primary components of the smart grid and the communications paths between these assets. The second part of the process was to create a work group to implement the roadmap and ensure the goals are executed efficiently. The group is called the Smart Grid Interoperability Panel (SGIP) and holds regular meetings to work on the action items identified in the roadmap. The final phase of the NIST process is to create a system by which components and systems in the smart grid are truly interoperable.

The NIST roadmap identifies 15 target areas, priority action plans (PAPs), within the smart grid where existing standards may be lacking, either in support of next-generation technologies or in needed cyber security protections. Two PAPs deal with communications: PAP01 intends to address suitability of IP for smart-grid communications, and PAP02 looks at the suitability of wireless

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communications to the smart grid. With the weight of NIST behind the project, high-level engineers representing wireless and IP standards groups met with utility engineers to create a plan. Communications engineers realized they knew nothing about electric grid communications systems, and utility engineers understood that the standards development process is often time consuming and complex.

For network traffic engineers to understand the needs of the smart grid and apply the appropriate technologies, an understanding of smart-grid communications requirements is necessary. The first step in both PAP01 and PAP02 was to map the smart grid and define every communications path. Use cases allowed the "actors" within the smart grid and important communications attributes such as data size, desired latency, required reliability and data security to be defined. The results of the analysis are being supplied to NIST, Institute of Electrical and Electronics Engineers (IEEE) and Internet Engineering Task Force engineers for study, modeling and ultimate configuration recommendations. The Department of Energy is then tasked with determining the bandwidth requirements of the smart grid and will rely on the work performed by NIST.

## 4 Goals of National Broadband Plan

1. Analyze the most effective and efficient mechanisms to ensure broadband access.
2. Provide strategy for achieving affordability and use of such a service.
3. Evaluate state of deployment.
4. Provide a plan for use of broadband infrastructure and services to serve national purposes.

### Public Safety

By accepting LTE as the standard protocol for public-safety broadband connectivity, the first responder community hoped to attract a commercial partner to build the last 10-megahertz block of the 700 MHz spectrum yet to be auctioned. Instead, the FCC will auction the band, removing the mandatory sharing requirement with public safety. The FCC also embraces LTE technology, but in a plan that would allow public safety access to commercial wireless networks, at a cost.

Meanwhile, the National Public Safety Telecommunications Council (NPSTC) created the Assessment of Future Spectrum and Technology (AFST) working group to update the Public Safety Wireless Advisory Committee (PSWAC) report, written in 1996 to document public safety's spectrum and technology needs through 2010. The new group seeks to define broadband spectrum requirements through 2020. Three task groups are preparing a report that will be based on a user survey and analysis of available technology. To quote the

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NPSTC Web site, "The [AFST] working group will deliver a final report that will identify the spectrum and technology required to meet user requirements and to help drive policy on spectrum, funding and other issues; standards development; and the public-safety vendor community."

### Similarity in Networks?

For public safety to determine if life without the D block will provide for needed broadband connectivity, the community must proceed in the same manner as the engineers in the smart grid NIST effort. There is a plethora of public-safety broadband use cases available for analysis, and the AFST effort will provide additional data. In some ways, the public-safety challenge is easier than those facing smart grid developers because LTE is defined as the enabling technology for the entire 700 MHz band. The public-safety use cases must define the same application characteristics as the smart grid: reliability, latency, data size and cyber security. The technical task group under AFST has a bandwidth model, developed for the 1996 report and updated for broadband. The group hopes that the maximum data rate needed for public-safety broadband can be applied to the model to determine how much spectrum is needed.

In a relatively short time, public safety and smart grid engineers will have reasonably accurate models of the data requirement of their respective networks. Each sector will decide which applications can move to commercial communications providers and what uses warrant building private broadband networks. Public safety understands that secondary access to a network funded by utilities will not work, and public-safety engineers are learning of the advanced routing capabilities of LTE. Perhaps federal funding for the public-safety network no longer encourages utility and public-safety partnership.

During the next year, NIST will complete a majority of its initial smart communications standards work, with a detailed understanding of smart grid communications. And the public-safety community will have a model of network communications requirements. The goal is to compare the requirements of each, analyze regulatory and financial incentives for network construction and determine is this one network or two? The result will likely be two networks. Is a combined network the best solution? Only time will tell. ■

Klaus Bender is professional engineer and director of standards and engineering for the Utilities Telecom Council (UTC). He is also a member of the Association of Public-Safety Communications Officials (APCO) International and participates in the APCO spectrum committee efforts. E-mail comments to Bender at klaus.bender@utc.org.

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# M·A·R·I·T·I·M·E INTEROPERABILITY

## Three Canadian provinces join forces to procure a regional Project 25 (P25) public-safety network.

**By Terry Canning**

In 1976, Nova Scotia, Canada, experienced a major forest fire lasting several days and destroying more than 33,000 acres of woodland and untold numbers of wildlife. There was no communications operability in this rural woodland area let alone interoperability; however, this event was the catalyst to push the province to develop and implement a provincewide, multiagency radio system.

The Nova Scotia Integrated Mobile Radio System (NSIMRS) was a conventional VHF network with six agency-discreet repeaters on each of 24 primary sites with microwave backhaul to a central switch where an operator could patch any two of the networks together — although it was rarely done. Users were able to use dual tone multifrequency (DTMF) keypads to dial from one repeater to any other within the network and to the central operator for a cross-agency patch.

Agency repeaters were allocated to police services, ambulance services, fire services, the province's departments of natural resources and transportation, and a general public-service network that included the Office of Emergency Management, public works, ground search and rescue, and school buses. Several agencies, notably the Royal Canadian Mounted Police (RCMP), added spur sites to improve coverage in specific areas of interest, and these repeaters were linked to the closest primary site for backhaul purposes. Aspects of the legacy NSIMRS continue to support volunteer fire services and ground search-and-rescue teams particularly for VHF tone-voice paging purposes.

By the mid-1990s, issues with the NSIMRS microwave backhaul hops were surfacing, and the six discreet networks provided insufficient capacity for the higher-use agencies, particularly police and ambulance services. The 1998 Swiss Air 111 crash off the

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Nova Scotia plans to encourage the full migration of operations to 700 MHz.

coast of Nova Scotia was a motivator to implement the next-generation provincial radio system — an 800 MHz Motorola SmartZone trunked system on 68 sites with backhaul on the Bell Aliant fiber-optic network. This system is owned and operated by the telephone company — the province is the anchor tenant — and includes numerous municipal and federal agencies that contracted directly with Bell Aliant for service. System capacity varies from site to site with a minimum of three voice paths and a maximum of 13 based on anticipated traffic and adjusted for actual system loading.

## Upgrade Decision

The contract between the province and Bell Aliant is scheduled to expire in May. So in 2006, the province had to decide whether to sign a contract extension or go to the market for a next-generation system. The latter choice was made. To give the province time to procure a new system, the contract was extended with better terms and conditions for two to five years as required with a six-month termination notice. Almost concurrently with Nova Scotia's decision to upgrade, the neighboring province of New Brunswick issued a request for proposals (RFP) for a trunking replacement of its conventional mixed VHF/UHF networks. The single proposal in response to New Brunswick's request wasn't accepted, forcing the province to return to the drawing board. Simultaneously, the province of Prince Edward Island recognized that its public-safety communications network was inadequate for the demands of the 21st century and needed improved coverage and capability.

The RCMP holds provincial policing contracts in all three provinces with members frequently crossing provincial boundaries. The RCMP's regional administrative arm helped orchestrate a meeting of officials where the possibility of a single regionwide public-safety radio system was discussed. There was sufficient interest in this approach; the responsible deputy ministers agreed to strike a working group of director-level personnel from each province to flesh out the concept to a memorandum of understanding (MoU).

The Maritime Radio Communications Initiative (MRCI) was officially launched in August 2008 and work began in earnest to develop a joint RFP for a Maritimewide public-safety/public-service radio network using the recently designated 700 MHz


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public-safety spectrum and the Project 25 (P25) standard for public-safety radio systems. An early consultation with the vendor community suggested that rather than a single three-province radio system, there were advantages to three identical radio systems with the controllers linked by the successful system vendor to provide seamless roaming for selected radios across the entire region or as much of it as required.

The province of Nova Scotia had staff and a procurement consultant already employed developing its RFP, while New Brunswick and Prince Edward Island had project leads designated. The MRCI working group agreed to contract with an expert procurement firm to pull together the stated objectives of each province and develop a single RFP that would result in the acquisition of the desired compatible radio systems. Through an opportunity presented by the Canadian Interoperability Technology Interest Group (CITIG), financial assistance was sought and provided by the Canadian Police Research Centre (CPRC) to offset some consultant costs. It's anticipated that the joint procurement will result in volume purchasing discounts, as well as the full regional interoperability desired. The rest of the networks will be funded with a public/private partnership with the selected vendor consortium to finance, build and maintain for 15 years, moving the capital cost off the provincial books and leaving the provinces with an annual operating cost.

The MRCI is making final adjustments to the RFP in response to a pre-release vendor consultation period held in February. The vendors were provided with a draft version of the RFP and a proposed schedule for final version release, response development, response evaluation and contract negotiation. The vendor community response provided substantial insight into the concerns of the various likely proponents. One of the biggest concerns expressed was related to the terms and conditions of the contract to which the successful proponent would be expected to agree. The MRCI had suggested that the pro-forma contract draft be released just prior to the closing of the RFP because it hasn't been fully developed. Almost universally, however, the vendors said that knowing the terms and conditions of the anticipated contract were as important to their official responses as the technical aspects.

Another major concern from the vendors was the uncertainty around the official agent(s) with whom they were expected to contract and work. An idea being considered is development of a special purpose vehicle or crown agency that would be constituted by delegates of the three provinces to act as the contracting party. This agency would be empowered to represent the interests of the provinces in any negotiations and provide a single point of contact for the successful vendor.

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**The ultimate governance model of the MRCS has yet to be developed; however, it is anticipated that there will be an administrative branch and an operational branch.**

The ultimate governance model of the MRCS has yet to be developed; however, it is anticipated that there will be an administrative branch and an operational branch. The administrative branch would focus on contractual and financial issues and service level agreements (SLAs), while the operational branch would deal more with interoperability, site capacity, and roaming opportunities and limitations.

### Beyond the RFP

The Nova Scotia team anticipates a major piece of work will be the effort required to develop user-friendly, intuitive and effective radio fleet maps and appropriate access to the various provincial, municipal and federal agency consoles. This work will be required regardless of which vendor is successful and is expected to begin in the near future. The biggest challenge will be ensuring the essential intra-agency communications, recognizing the geographic size of the three provinces and the nonaligned regional structure of their respective user departments. Another challenge is concurrently recognizing and accommodating the necessity of interoperability across agencies and between jurisdictions, when and where required and as authorized.

For example, there will be about 84 tower sites in Nova Scotia, approximately 12 in Prince Edward Island and more than 100 in New Brunswick. Along the Northumberland Strait and the Bay of Fundy it's expected that radios will be able to see repeater sites on the opposite side of the separating water body in the neighboring province. The arrangements for permitting or disallowing roaming between the home and neighboring systems across the water have to be carefully planned to take advantage of the coverage offered while not unreasonably overloading the neighboring system repeaters. Another critical piece of work, yet to be fully explored, is the initial and ongoing user training required to make the MRCS successful. Nova Scotia has had a full-time user trainer since late 2002, and province officials anticipate there will be a continuing need for this resource and several more during the system implementation.

All three provinces rely heavily on volunteer fire services, and they rely on VHF tone-voice paging for notification of a need for their services. Each province has legacy VHF infrastructure in place, and all of the volunteer fire services have a significant investment in tone-voice pagers that can't be replaced without substantial injection of capital funds. Each province is working with its own fire service representative body — New Brunswick Association of Fire Chiefs, Prince Edward Island Firefighters Association and Fire Service Association of Nova Scotia — to determine how best to leverage the capabilities of the next-generation radio system to ensure ongoing reliable and thorough VHF paging coverage, recognizing that the pagers are analog and CTCSS tone activated.

The Nova Scotia volunteer fire service is operating primarily using analog VHF radios with two- or three-seeded trunked radios loaned to each volunteer department to enable interoperability with other response agencies. The future plan is to encourage full migration of operations to 700 MHz with the rest of the province, but this will be determined by the ability to find funds to replace VHF radios rather than by any other driver. Fire services in Prince Edward Island are being encouraged to fully migrate to 700 MHz, while New Brunswick fire services are planning to remain fully on VHF with interoperability with other agencies accomplished through console patches.

While the ultimate MRCS will be a model of interoperability and cooperation that may well be the envy of the country, there are also interoperability relationships yet to be considered and developed with jurisdictions outside the three Canadian Maritime provinces. The province of New Brunswick shares significant length borders with the U.S. state of Maine and the province of Quebec, and cross-border communications with these neighbors will be desirable for some agencies, probably using the Inter Subsystem Interface (ISSI) feature of the P25 standard. The upcoming three to four years will witness a Herculean effort on the part of the implementation teams; however, the successful rollout will serve the user community effectively for many years going forward with periodic refreshment of user equipment and ongoing maintenance of system software and firmware, along with continuous training and multiagency user exercises. ■

Terry Canning is the emergency communications coordinator for public safety and field communications (PSFC) in Shubenacadie, Nova Scotia. He is responsible for facilitating and training for interagency radio communications during emergency incidents and planned multiagency events. Canning has been an active volunteer fire fighter since 1980, has served terms as training officer and captain, and has been the deputy fire chief since 1998 in Brookfield, Nova Scotia. Canning joined the trunked mobile radio system (TMRS) implementation team in 2000 as a consultant supporting the volunteer public-safety community, developing radio configurations and coordinating installation and delivery of about 1,000 loaned trunked radios and training. E-mail comments to canningt@gov.ns.ca.

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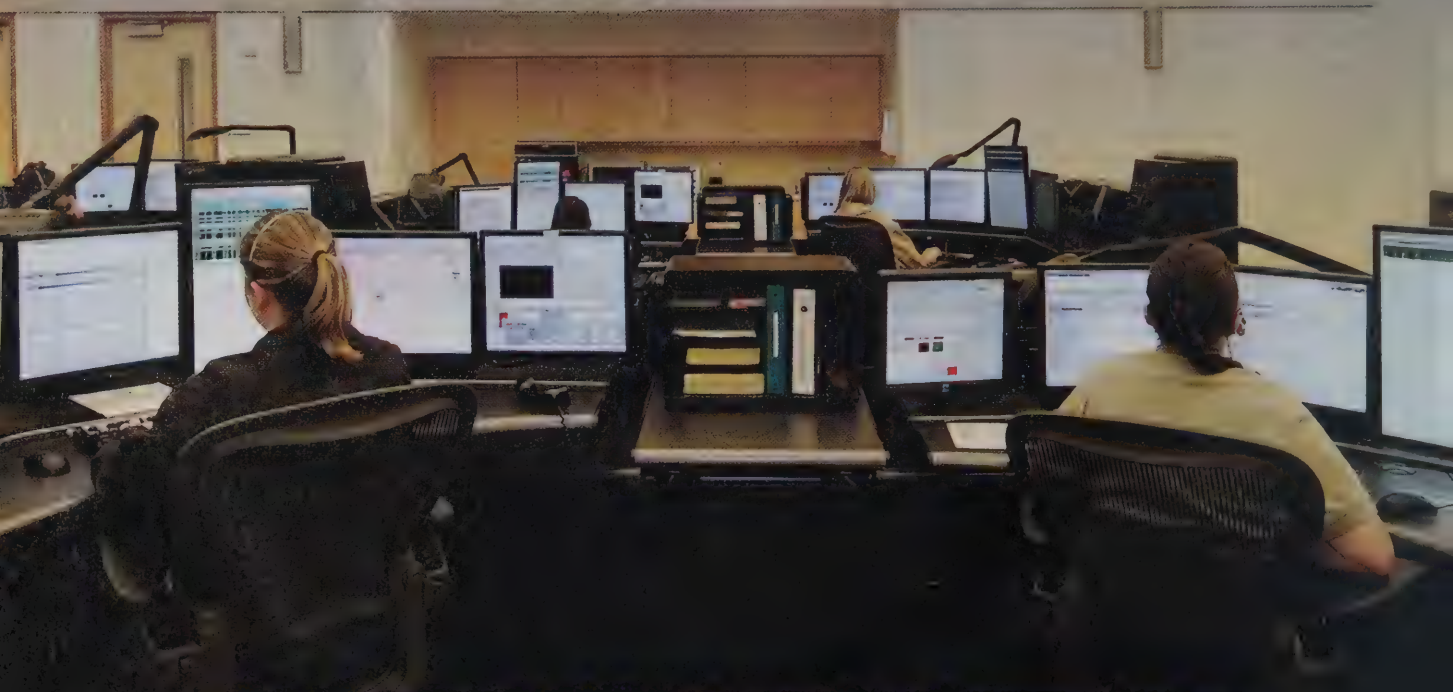

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Top to bottom: Horizon West Apartments in Boulder, Colo.; Colorado Convention Center in Denver; NIST building in Boulder
Right: Republic Plaza building in Denver

# In-Building Signal Tests

Researchers measure 700 MHz radio signal penetration into large buildings to track the propagation environment in emergency response situations.

**By Kate A. Remley, Christopher L. Holloway, William F. Young**

The National Institute of Standards and Technology (NIST) in March released the sixth in a series of NIST technical notes (TN) on penetration of radio signals into large building structures, including apartment complexes, hotels, office buildings, sports stadiums and shopping malls. The reports are intended to give emergency responders and system designers a better understanding of what to expect from the radio-propagation environment in emergency response situations. The goal of the project is to create a large set of public-domain data describing the attenuation and variability of radio signals within various building types in the public-safety frequency bands.

The first, second and third NIST TNs — NIST TNs 1540, 1541 and 1542 — described experiments related to radio propagation in a structure before, during and after implosion. The next two notes — NIST TN 1545 and 1546 — focused exclusively on RF

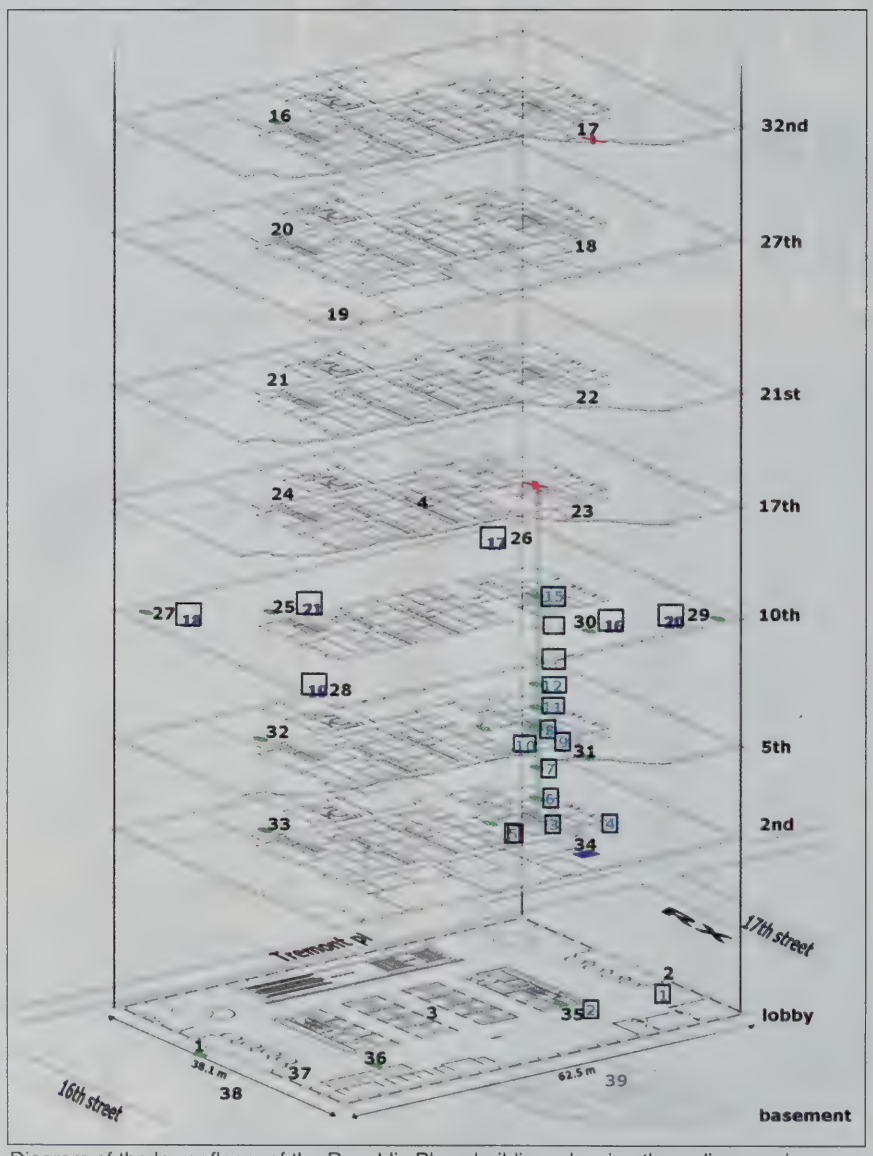



Diagram of the lower floors of the Republic Plaza building, showing the radio-mapping transmitter locations by black numbers, as well as the synthetic pulse measurements, shown by blue numbers inside the squares.

signal penetration into large buildings, with no implosion results.

In the most recent NIST TN 1552, additional measurements were carried out in the 750 MHz frequency band. Because the FCC is in the process of auctioning the D block spectrum with plans for public-safety shared use, NIST researchers studied radio signal penetration in this frequency band into four different large building structures: a convention center, a high-rise office building, an apartment building and a laboratory/office building. Two different types of signal measurements included:

- Radio mapping, where RF transmitters were carried throughout the structures and signals were received at fixed sites outside the structures, and
- Broadband measurements that provided the time-response characteristics of the radio environment.

These latter measurements are useful in understanding the level of reflectivity or multipath in a given structure. This article overviews the measurement methods, an example of the measurement data collected and a brief interpretation of the results.

## Measurement Methods

A fundamental challenge to radio communications into and out of large buildings is the strong attenuation of radio signals caused by losses and scattering in a building's materials and structure. A second issue is the large amount of signal variability because of multipath that occurs throughout the large structures. The NIST measurements were conducted in four large building structures in an effort to quantify radio-signal attenuation and variability in scenarios encountered by emergency response organizations.

The NIST measurements were intended to simulate an incident command scenario where a fixed-location incident command station is located outside a structure while a mobile unit is carried within the building. The data presented in the NIST study can be used to describe the radio channel from outside a building to inside in point-to-point communications situations. With some additional modeling work, they can also be used to develop models of emergency response trunked or cellular systems. In the latter case, the data would form the last leg of the communications link.

The first type of measurements, referred to as radio mapping, provided a continuous recording of received signal strength at a fixed location outside the structure while a transmitter was carried through the structure. The transmitter emitted an unmodulated, 749 MHz radio signal from within the structure. The goal with these measurements was to cover as much ground in the structure as possible to provide a detailed description of the statistical variation in received signal strength from signals transmitted within a given structure. By covering the routes that would be walked by emergency responders within a structure, public-safety officials and researchers can understand how strong or weak a signal will be, in terms of the average, maximum and minimum received signal levels. Equally important, the expected variance in signals in the 750 MHz band can be determined.

The second type of measurement

## Aggregate Statistics for Radio Mapping Results

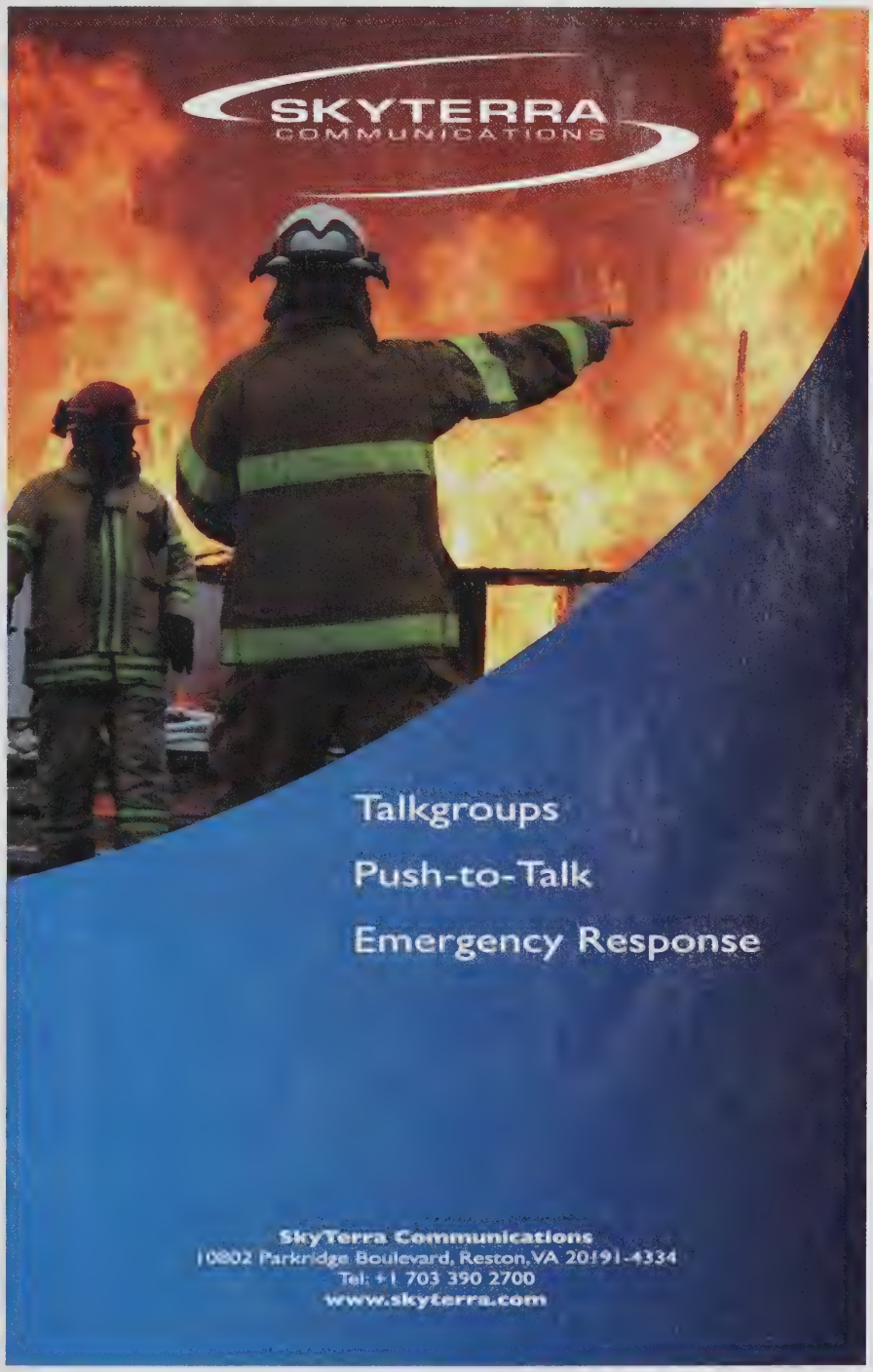
| | Median (dB) | Std. Dev (dB) | Ref. (dBm) |
|---|---|---|---|
| Republic Plaza Receive Site One | -68.3 | 20.3 | -29.3 |
| Republic Plaza Receive Site Two | -60.0 | 21.5 | -32.7 |
| Republic Plaza Receive Site Three | -49.3 | 17.8 | -49.8 |

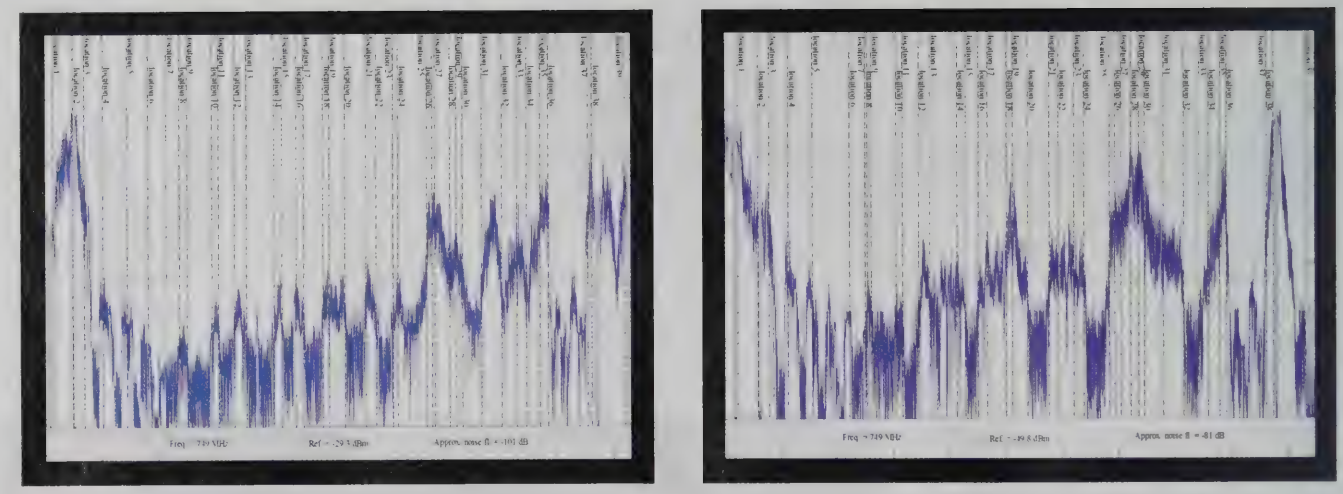
tested the time-domain response of the channel at particular locations within the buildings by use of a synthetic-pulse measurement system. These measurements used a vector network analyzer with its output port tethered to the receive antenna by a fiber-optic cable to allow reconstruction of the time-domain response of the propagation channel. With this system, we can effectively reconstruct a short-duration pulse in post processing. The short pulse enables the study of the multipath in a given environment. Figures of merit such as the root-mean-square (RMS) delay spread may be calculated and used to quantify the time required for multipath reflections to decay below a given threshold level.

### Penetration into Structures

Large public buildings were chosen for the research because they are expected to present the biggest challenges to emergency response communications. For the measurements at Republic Plaza, a 57-story office building in downtown Denver, three receive sites were used that varied substantially in distance from the building. Receive site one was located about 11 yards (10 meters) from the building; receive site two was about 27.3 yards (25 meters) from the building; and receive site three was located on the roof of a parking garage about 235 yards (215 meters) away. These locations were intended to simulate the locations of command vehicles in an emergency response scenario.

The graphs on Page 38 show two examples of the radio mapping results for the Republic Plaza building. These graphs show the relative received signal levels for two different receive-site orientations with respect to the building. The line-of-sight reference signal is clearly seen by the distinct largest peaks in the plots. In the table above, the additional free space path loss for receive site three is evident in the approximately 18 dB reduction in the reference value compared with values obtained at receive sites one and two. The table also shows that the variation in the received signal levels at all three receive sites given by the standard deviation is similar. Note that the data are normalized by the reference value, which is a line-of-sight signal, so that we can study the propagation





Republic Plaza building receive site three (left) and receive site one (right). Normalized received signal power as the 749 MHz transmitter is carried through the building.

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effects due to the building. The median and standard deviation results are for the normalized data.

Synthetic pulse measurements were also carried out at positions marked by numbers in rectangular boxes in the diagram, with the vector network analyzer (VNA) located at receive site one. We calculated the RMS delay spread from the data. Twenty-one positions within the building were tested, and 18 of those positions had sufficient dynamic range to provide useful results.

The RMS delay spread was calculated for several different frequency bands. The measurements were made in the stairwell between floors. The RMS delay spread was lowest at the landing of each floor, where a window was located. The delay spread increased moderately as the height increased from around 50 nanoseconds on floor one to around 150 nanoseconds on the highest floor. But when the measurements were made deeper within the building on floors five and 10 (positions nine, 10 and 16), the RMS delay spread increased significantly to between 300 and 450 nanoseconds, depending on the location and the frequency band used to calculate the RMS delay spread.

## Results from the Structures

The measurement data showed a wide range of received signal levels and a high variability for these. For

the radio mapping experiments, the median values for all four buildings calculated for data normalized to a direct line-of-sight path ranged from -25.1 dB to -98.5 dB, and the corresponding standard deviation values ranged from 6.8 dB to 30.1 dB. These factors can complicate radio system design because engineers need to design systems that will provide reliable reception in weak-signal conditions, but also systems that will track signals that vary from weak to strong.

The synthetic pulse measurements show that the level of reflectivity — multipath — in the structures was negligible to moderate. The RMS delay spread results ranged from 15 to 450 nanoseconds at various test locations within the four buildings. The RMS delay values for measurements made in large open floor plan buildings were two to five times that of measurements in buildings with relatively narrow corridors. Many radio technologies can handle this level of multipath, although these numbers could change significantly if a trunked or cellular system design were used, rather than the point-to-point systems described in this research.

The measured results provide key parameters that describe the wireless propagation environment in representative responder environments. NIST hopes that improved channel descriptions provided by these measurements will be useful for assessing current and future wireless technology in emergency scenarios, for standards development and for qualifying wireless equipment in environments such as those studied in this research project. ■

## More Information

■ For the full NIST TN 1552 and other technical notes, visit: www.nist.gov/eeel/electromagnetics/rf_fields/wireless.cfm

■ For more figures and graphs, visit www.MCCmag.com.

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**Editor's Note:** This work was funded by the NIST Public Safety Communications Research (PSCR) Laboratory, through the NIST Office of Law Enforcement Standards (OLES).

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## CoCo Communications

The CoCo Tablet Docking Radio Gateway (TDRG) enables different radio systems to interoperate with each other. UHF, VHF and 800 MHz radios can communicate with one another regardless of if they are analog, digital, trunking or Project 25 (P25) encrypted. The system easily connects to a tablet PC, has four radio ports, weighs 2.2 pounds, and uses a patented FIPS 140-2-certified security encryption protocol. When connected to a tablet PC running the company's Interoperability Controller, the gateway can create a secure conference with any IP device.

www.cococorp.com

## Cody Computer Services

Collaborative Object-Based Regional Access (C.O.B.R.A) Version 4 is a proven suite of applications that enable agencies to share data. The system delivers real-time multijurisdictional information in a secure manner to officers and agents in the field, regardless of what disparate systems each agency has, and is respectful of agencies' sharing rules, privacy concerns and prevailing data standards. Using the company's Silo Approach, the system keeps each contributing agency's information segregated from all others in its own Insulated Data Silo. Powered by ExpressBridge, Cody's real-time data fusion technology allows disparate systems to speak the same language and share data in real time.

www.codycomputer.com

## Daniels Electronics

Daniels Electronics recently launched its new Project 25 (P25) Five Channel Trunked Radio System, which provides a small, compact, low-power stand-alone system for customers requiring digital P25 communications for a large number of users from a single site. For police, fire or utility applications, the radio system can be quickly deployed on a temporary or permanent basis without complex network or console interfaces. The system builds on the existing MT-4E P25 conventional hardware platform and requires no changes to the RF hardware.

www.danelec.com

## FirstWatch Solutions

FirstWatch aggregates data from multiple agencies with disparate or similar data sources to provide a real-time, regionalized perspective across geopolitical boundaries. Dashboards provide secure, interoperable data views such as maps and charts and drills down into public-safety data for situational awareness, data intelligence, and performance and operational measures — all based on user-defined criteria. Once volumetric trends or geographic patterns are detected, FirstWatch automatically alerts user-defined personnel. The system seamlessly interfaces with EMS, fire and law enforcement CAD data, ProQA, Patient Care Report (ePCR) data and hospital data.

www.firstwatch.net

## Harris

The Unity XG-100 supports digital

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> Solar Panel Blankets & Mast Antenna Systems available

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## Interoperability

Project 25 (P25) secure and analog FM communications across VHF, UHF, 700 and 800 MHz public-safety bands. Radio capabilities enable first responders to use a single radio to communicate with multiple jurisdictions and agencies operating on different frequencies and systems. The radio features multiband operation such as cross-band scanning, ambient noise suppression and integrated GPS with a large, full-color display for situational awareness. The radio is built to military standards and features a software-defined radio (SDR) architecture that allows flexibility for future growth, including P25 Phase 2 TDMA standards.
www.harris.com

### Icom America

Icom's portable F9011 series and mobile F9511 series offer Project 25 (P25) trunking, conventional and analog mixed-mode operation allowing agencies to

grow into P25 compliance. The radios provide 512 channels, 128 zones and Mil-Std-810-F construction. The F9011 portables come in three versions — no keypad, simple keypad and full keypad. Each portable offers a familiar A-B switch design and clear and loud audio. The F9511 mobiles come in simple or full keypad versions, and up to two remote control heads can be fitted. A 110-watt version is also available.
www.icomamerica.com

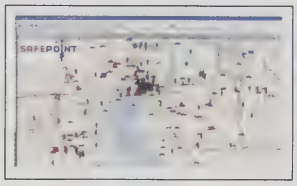
### Link Communications

TCB-iP2v allows communications between two-way radios, Verizon Wireless push-to-talk (PTT) phones, handhelds, mobile or base stations, plus dispatch consoles and other analog systems,

allowing users to operate two-way radios anywhere on the Verizon nationwide network. iP2v includes VoIP, with support for session initiation protocol (SIP), rapid transmit protocol (RTP), multicast and unicast operation. Digital VoIP (SIP/multicast) communications over network connection is also available with a provided Ethernet port. Users can completely control the handset, with the option to talk to one person or a group with included Windows Graphical Interface Software. The system supports optional Link-TDS dispatch software, providing a dispatch center or large network managed solution.
www.link-comm.com

## Locus Location Systems

SafePoint is an interoperable non-GPS radio location system capable of locating radios across multiple agencies, frequencies and protocols and displays in one display. The system operates with any trunked radio system and doesn't require




modification to the radios or the network. The system is 136 – 174, 403 – 512, 764 – 776 and 802 – 869 MHz capable, and is a powerful resource management tool for visual coordination and tracking radio resources simultaneously. Based on time difference of arrival (TDOA), the system locates law enforcement, fire, EMS, local and federal agencies and displays them on a single screen for situation awareness.
www.locususa.com

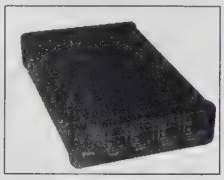
## Midian Electronics

The IS-1 interoperability switch and cross-band repeater maker has two ports to

interoperate two different radio systems. For example, a VHF Project 25 (P25) radio system can interoperate with a conventional UHF radio system. The switch also has an enable/disable option for disabling the switch when interoperability is not desired using DTMF, five-tone, two-tone or pulse tone signaling. The switch can operate off an internal battery power or external power from a radio or a wall adapter. Preconfigured cables for some radios are also available.
www.midians.com

## New Communications Solutions

Two new interoperability controllers are



available. The NCS-C150 is a two-radio repeater, while the NCS-C350 is a four-radio repeater with two independent talk groups. Features include remote control

Midian's NEW Interoperability Products

Shown: IS-1

**IS-1: Interoperability Switch/Cross-Band Repeater Maker**
Midian's IS-1 is an interoperability switch allowing 2 radio systems on different channels, bands or protocols to communicate with one another. For example a UHF radio and an HF SSB radio can interoperate or a VHF radio can interoperate with an 800 MHz P25 radio. This is ideal for interagency cooperation in emergency situations.

**Repeater Interoperability Controllers**

**RIC-2:** The RIC-2 is a tone remote adaptor that allows 2 RIC-2 equipped repeaters connected by a dedicated line or microwave to allow radio users on one repeater to communicate with radios users on the other repeater and/or the dispatcher.

**RIC-8:** Midian's RIC-8 is a tone remote adaptor that allows 2-8 RIC-8 equipped repeaters/ base stations to interoperate over a dedicated line activated by DTMF signaling from a tone remote controller or field radio.

Shown: RIC-2

email: sales@midians.com • website: www.midians.com • phone: 1-800-643-4267 • 520.884.7981

via DTMF tones from a radio port or a separate control receiver input, selectable carrier-operated relay (COR) or voice operated transmit (VOX), and selectable audio delay. The units work with conventional, trunked and Project 25 (P25) radio systems, have small form factors and can be used in mobile applications or at fixed locations. Interface cables are available for most radios, satellite phones and Sprint Nextel and Verizon Wireless push-to-talk (PTT) phones.

www.ncsradio.com

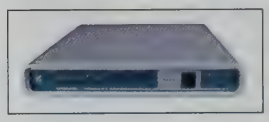
### Northmark Communications

The DTS-Dispatch portable radio dispatch console is a portable radio dispatch and command communications center for two to four radios. The console sets up in minutes and works with most mobile radio configurations or rack-mounted base radios that run on 12 volts. The console features built-in AC supply with auto-switchover to external battery backup, along with rugged roto-molded plastic rack case with front and rear covers. The system includes antenna tripods, antennas, cables and rugged carrying cases for accessories. Portable repeater versions are available. For audio logging recorder interconnection, specific models must be used.

www.northmarkcommunications.com

### Omnitronics

The IPR110 allows a remote user with a DTMF keypad to connect to a session initiation protocol (SIP) phone or server from the field, and users can become independent from 24/7 dispatch monitoring points. The user-defined connectivity can be mixed with the ability to connect to other repeater sites, allowing users to work independently in their own radio cells and with simple DTMF sequences users can also connect to users in different geographical regions or other groups of users in their regions. Up to 12 SIP connections can be made between phones and/or repeater sites. The product is Web browser accessible, so a centrally based technician can setup an entire IP network system. Audio level, new firmware versions and diagnostic information can be sent and collected from each remote device.



www.omnitronicsworld.com

### PlantCML

The CORP25 solution brings one of the first system-level Project 25 (P25)-compliant digital

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trunked radio subsystems to the North American market. Leveraging the power of an IP network and the P25 standard, the system is an open-standards architecture enabling collaboration among local, regional, state and federal organizations. With its open, multivendor design, software-driven architecture and native IP core, the system is the optimum solution for next-generation public-safety communications, company officials said.
www.plantcml-eads.com

## Quintron Systems

Quintron Systems announces a new operator station for use with the DICES VoIP interoperability voice switch. The

new design uses a single-board computer packaged for easy mounting in a variety of positions. A custom Linux image (Q-Linux) is used that has external ports deactivated for greater security, reduced IA visibility and improved latency performance. A fanless CPU and solid-state disk are used for increased reliability. A touchscreen monitor provides the user interface with desktop or swing-arm mounting arrangements. All features of DICES VoIP, including radio phone integration and real-time conferencing, are included.
www.quintron.com

## Radio Systems Marketing

The Sierra 400 compact multiradio mobile communications post is a compact platform and duplexer antenna system less

than 30 inches deep, which fits behind a Chevy Suburban's third row of seats. The system includes 10 radios; two full-duplex NXDN FM/digital base stations with duplexers in 150 and 450 MHz; two Project 25 (P25) radios in 150 and 450 MHz; five FM radios in 50, 150, 800 and 900 MHz; and one multiband P25/conventional/trunked scanner. The system also features Broadband Global Area Network (BGAN) satellite and EV-DO Revision A access, 19-inch touchscreen PC, local/remote TCP/IP dispatch, wireless notebook PC dispatch, four session initiation protocol (SIP) lines and server, and 600 watts sine-wave DC/AC generator.
www.radiocomsys.com

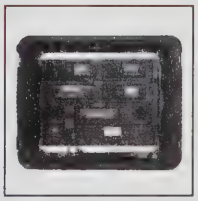
## Relm Wireless

Relm Wireless successfully completed Project 25 (P25) interoperability tests on Motorola's ASTRO P25 system infrastructure. The KNG-series radios demonstrated interoperability by passing all of the required P25 Phase 1

Portable Incident Command Systems

Fast & Flexible Communications!

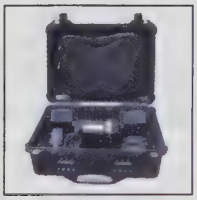
When emergency response teams arrive on scene you need a communication system that can link dissimilar radio systems. What if the incident is in an area that your command vehicle can not reach? Moreover, what will you do if the command vehicle is supporting a separate incident? The solution is a QuickLinx system from New Communications Solutions (NCS). NCS provides a variety of Portable Incident Command Centers from Grab & Go briefcase size systems to eight radio configurations housed in waterproof shock type cases with integrated wheels and handle. The systems are self contained and easy to set up and comprise the NCS-C250 Mobile Multi-Switcher along with customer defined radios, interface cabling, power supply, microphone, speakers and cabling to connect to external power sources.



QuickLinx M
For Mobile and Portable Radios

- *Interoperable Repeater*
- *Transportable Dispatch Console*
- *12V/120V Operation*

The NCS-C250 Mobile Multi-Switcher connects four radios to one microphone and 2 speakers providing select/unselect audio control. The Crossband repeat function connects 2 to 4 radios. Expandable to 8 radios.



QuickLinx P
Grab & Go Case
For Portable Radios

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Common Air Interface (CAI) trunked interoperability tests specified by the Telecommunications Industry Association (TIA) and the U.S Department of Homeland Security (DHS). The testing was conducted at Motorola's lab as part of the formal P25 Compliance Assessment Program (CAP).
www.relm.com

## SkyTerra

The MSAT-G2 radio supports continentwide group and private push-to-talk (PTT) communications, the origination and reception of telephone calls, and two-way transfer of

data. Additional features include GPS capability and flexible interconnectivity to a variety of interoperability interfaces. The radio supports talk groups that can be configured to allow for interagency communications among local, regional and national emergency response organizations. And the Satellite Mutual Aid Radio Talk (SMART) group is a program on SkyTerra's nationwide satellite network that lets talk groups enable critical, interoperable communications among various public-safety agencies and departments across the United States.
www.skyterra.com

## Strix Systems

The MWS100-HSX10 is a cost-effective, dual-radio mesh node that is complementary to other Strix mesh nodes and delivers robust data, video surveillance, VoIP and mobility. The radio employs the company's Access/One DMA mesh algorithms, centralized manageability, high-

performance Layer 2 switching architecture, 400 megawatts radio transmit power, end-to-end quality of service (QoS), the highest level of wireless security standards, and frequency support for 2.4, 4.9 and 5 GHz. The node is easily deployable, automatically and instantly self configuring and provides superior performance, security and flexibility. The product's applications include deployment in outdoor malls, event venues, public safety, mobile and industrial applications, company officials said.
www.strixsystems.com

## SyTech

The SyTech Radio Interoperability System (RIOS) combines the RIOS software-defined radio input/output channels with

the sophistication and ease of use of the RIOS graphical user interface. Users implementing the system have the ability to interconnect all types of trunking and conventional radios, satellite and cellular phones, PCs and telephones, as well as IP video feeds and smart phones running the RIOS Lite Smartphone application. The encompassing IP system results in a powerful multisite/multiuser voice, video and data interoperability platforms in use by federal, state, local and commercial organizations.
www.sytechrios.com

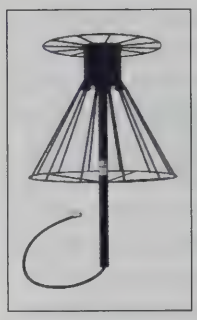
## Tait Electronics

The new Tait Key Management Facility (KMF) is a flexible tool for any agency

seeking to confidently and efficiently manage its Project 25 (P25) encryption without interrupting critical communications. The easy-to-use KMF has a custom dashboard, enabling crypto officers to see information the way they need to. Different teams' keys can be updated at a time to suit their operational profiles. The system can update groups in batches of any size over the air. Other manufacturers' P25 radios can also be managed conveniently, while remote diagnostics save technicians' time from wasted visits.
www.taitworld.com

## Telewave

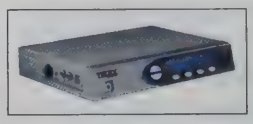
The ANT280S is a rugged interoperability antenna with 500-watt power handling for all frequencies between 132 MHz and 3 GHz. The antenna weighs 10 pounds and



can be field deployed or replace multiple antennas on a mobile command vehicle. The antenna can also be permanently mounted for long-term operation with an available dual-clamp kit. The antenna is built from welded 6061-T6 solid aluminum and protected with a tough full-surface coating. Each antenna provides a cable with N-male connector and is ready to operate with a single or multiband radio using one antenna output. Several types of low-loss couplers are available for multiradio operation.
www.telewave.com

## Telex Radio Dispatch

Designed to work with the Telex C-Soft console, the new Telex ADHB-4 Advanced Digital Headset Box processes audio internally and transfers the signal



via USB, eliminating dependence on PC sound cards and removing the barrier between users of different PC audio platforms. Compatible with both Microsoft Windows 7 and Windows XP, the product includes all the connections necessary for integration into the most common radio dispatch configurations, including footswitch input, output relays, auxiliary inputs, RJ11 mic, XLR mic, 0.25-inch headset jack and more. The system supports up to six speakers per position and is equipped with a full-color LCD screen.
www.telex.com/radiodispatch

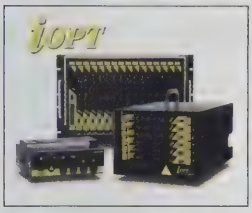
## Thales Communications

In early 2009, Thales Communications' Liberty multiband radio became the first FCC-approved multiband radio covering the entire public-safety spectrum. The LMR enables interoperability across all public safety bands: 136 – 174, 380 – 520, 700 and 800 MHz, all in a single portable radio.

The radio provides all modes standardized for public-safety use, including analog FM and Project 25 (P25), conventional and trunked. The portable also provides full encryption capabilities, including Data Encryption Standard (DES), Advanced Encryption Standard (AES) and over-the-air rekeying (OTAR).
www.thalesliberty.com

### Trident Micro Systems

The iOPT line provides interoperability for all bands. The portable Comm-Tac allows grouping of up to four different radio sources on the fly from anywhere by pressing and connecting to a new talk group. The mid-sized iOPT 612 is




equipped with a portable handle for tactical environments and is capable of connecting up to 12 different resources. Equipment is remotely configurable. The iOPT 1630 is the biggest and expandable to up to three units, allowing connectivity of up to 126 independent resources. Easy drag-and-drop GUI software visually keeps groups together.
www.tridentms.com

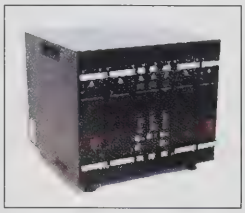
### Twisted Pair Solutions

The Mobile Communicator for BlackBerry enables users to tune their mobile devices

to a WAVE-supported two-way radio channel. The software uses WAVE Thin Client technology to create a new architecture for radio communications across cellular and Wi-Fi networks. The product can be used to communicate on a WAVE network in the same way as other WAVE endpoints and can be used to make secure, point-to-point calls between two devices across any network.
www.twistpair.com

### Westel Wireless Systems

Westel released a new feature on its DRB-25 Project 25 (P25) repeater product to enhance the migration from



analog to P25 digital operation while using legacy consoles and remotes. When receiving a P25 signal, the P25 subscriber identification (ID) is sent over the wireline interface as an MDC1200 push-to-talk (PTT) ID message. This enables the dispatch operator to identify the mobile/portable originating the transmission without requiring the console to be upgraded to support P25 signaling. The IP link that enables two repeaters to be connected back-to-back over an IP network is now available. Both features are available as a software upgrade.
www.westelwireless.com

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# Specs Survey: Headsets

The following companies submitted information for this Specs Survey. For more headset suppliers, visit SuperGUIDE at www.MCCmag.com.

| MANUFACTURER→ | Acousticom | Astra Radio Communications | Astra Radio Communications | Astra Radio Communications | BatteryJack | CeoTronics | CeoTronics | CeoTronics |
|---|---|---|---|---|---|---|---|---|
| PRODUCT NAME→ | Talk Thru | T21 series | T24 series | B45 series | Titan H2 series | CT-CombatCom | CT-ClipCom | CT-Action neckbands |
| ↓SPECS | | | | | | | | |
| Suggested list price | $375 | $60-$92 | $95-$125 | $179-$245 | $45 | $799-$1,299 | $699-$1,199 | $449-$799 |
| Type of headset | Behind the head | Single-wire surveillance mic | Tactical open throat mic | Earbone conduction mic | Single ear piece/ boom mic | Headstrap/helmet clip w/waterproof boom mic | In-ear, low-profile earpiece/ear mic or boom available | Behind the neck, classic, vibration or audio tube, waterproof, PTT avail. |
| Weight | 23 oz. | 6 oz. | 8 oz. | 6 oz. | 3 oz. | 8 oz. | 6 oz. | 6 oz. |
| Power supply | 2-10 VDC | Provided from radio | Provided from radio | Provided from radio | Provided from radio | Provided from radio | Provided from radio | Provided from radio |
| Modes | PTT, external mic | PTT | PTT, electret sensors | PTT, earbone conduction | PTT | In-line modular PTT | In-line PTT | In-line PTT |
| One or two sides | 1 | 1, fits left or right | 1, fits left or right | 1, fits left or right | 1 | 1 or 2 | 1 or 2 | 1 or 2 |
| Noise reduction mic | 15-25 dB | -- | Yes | Yes | No | -- | -- | -- |
| Noise reduction speaker | -- | -- | -- | -- | N/A | -- | -- | -- |
| Type of microphone | Electret, dynamic | Single-wire surveillance mic | Tactical open throat mic | Earbone conduction mic | Boom mic | Noise-canceling electret, waterproof | Noise-canceling electret/dynamic | Noise-canceling, near-field response electret |
| Pivotable microphone | Yes, 2 styles | Yes | Yes | Yes | Yes | Yes | Ear: no; boom: yes | Yes |
| Mic frequency response | 100 Hz-10 kHz | -- | -- | -- | N/A | 100 Hz-10 kHz | 300 Hz-3 kHz | 300 Hz-3 kHz |
| Mic output | 98 dB | -- | -- | -- | 110 dB | Matched to radio spec | Matched to radio spec | Matched to radio spec |
| Speaker output | -- | -- | -- | -- | 2 W | Radio dependent | Radio dependent | Radio dependent |
| Headband material | Nylon strap | -- | -- | -- | N/A | Spring metal w/rubber sheath | N/A | Spring metal w/rubber sheath |
| Earcup material | Plastic | Hypoallergenic rubber ear insert | Hypoallergenic rubber ear insert | Hypoallergenic rubber ear insert | Foam | Plastic, cushion at ear | Hygienic/medical plastic earpiece | N/A |
| Colors | Black, blue, red, yellow | Black | Black | Black | Black | Black | Black | Black |
| Helmet compatible | Yes | -- | -- | -- | Yes | Yes | Yes | Yes |
| Volume adjustment | No | -- | -- | -- | No | Yes | Yes | Yes |
| Sidetone | No | -- | -- | -- | No | Yes | Yes | Yes |
| Intrinsically safe rated | No | Yes | Yes | Yes | No | -- | -- | -- |
| Amplified mic | Opt. | -- | -- | -- | No | Yes | Yes | Yes |
| Amplified gain switching | No | -- | -- | -- | No | No | No | No |
| Adjustable headband | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes |
| Optional eartips | No | Yes | Yes | -- | No | -- | -- | -- |
| Also acts as 2-way radio | No | -- | -- | -- | No | No | No | No |
| Custom build available | Yes | -- | -- | -- | Yes | -- | -- | -- |
| Warranty | 5 years | 1 year | 1 year | 1 year | 1 year | 3 years | 3 years | 3 years |
| Features/options | Wire or flex booms, high-flex life cables, strain relief, more | Hirose connector | Hirose connector | Hirose connector | N/A | -- | -- | -- |

| MANUFACTURER→ | CoachComm | Cobalt | Cobalt | Cobalt | David Clark | David Clark | David Clark | Firecom |
|---|---|---|---|---|---|---|---|---|
| PRODUCT NAME→ | CrewCom | CobaltAV CH-21 | CobaltAV TM | CobaltAV TT | H3342 | H6040 | H6090 | UHW-10 |
| ↓SPECS | | | | | | | | |
| Suggested list price | -- | $257 (cable $44-$75) | $99+ | $159+ | $303 | $291 | $262 | -- |
| Type of headset | Multiple options | Behind-the-head, support dual muff w/detachable cord | Throat mic system including acoustic ear-tube speaker | Rugged, lightweight temple transducer headset w/boom mic | Behind the head for use in many intercom systems | Behind-the-head two-way radios; use w/adapter or intercom | Single-ear mobile/ portable radios; regular radio adapter | Under the helmet with charger |
| Weight | Belt pack: 1 lb.; base station: 2.2 lbs. | 13.3 oz. | 3 oz. | 2 oz. | 16 oz. | 14.5 oz. | 8 oz. | 17.8 oz. |
| Power supply | 5 VDC | Bias voltage from radio | Bias voltage from radio | From radio | From intercom | From radio/intercom | From radio/intercom | 3.7 V Li-ion batt. |
| Modes | Full duplex | Dome mount PTT | Inline PTT options | Inline PTT | -- | PTT w/adapter | PTT w/adapter | PTT, full duplex |
| One or two sides | Both | 2 | 1 | 2 | 2 | 2 | 1 | 2 |
| Noise reduction mic | N/A | Cobra noise-canceling mic (opt.) | Yes | Cobra noise-canceling mic (opt.) | -18 @ 2 kHz | -10 @ 2 kHz | -10 @ 2 kHz | 60 dB |
| Noise reduction speaker | N/A | Active noise canceling (opt.) | -- | Vibrates thru skin for listen | 24 dB | 24 dB | N/A | -- |
| Type of microphone | Electret, dynamic | Noise canceling electret (dynamic avail.) | Electret throat mic | Electret | Amplified dynamic wire boom | Electret, flex boom | Electret, flex boom | Electret |
| Pivotable microphone | N/A (boom pivots) | Yes, full flex | Sliding neck adjust | Yes, mini flex | Yes | Yes | Yes | Yes |
| Mic frequency response | Varies | 300 Hz-8 kHz | 300 Hz-8 kHz | 150 Hz-10 kHz | 300 Hz-6 kHz (approx.) | 300 Hz-6 kHz (approx.) | 300 Hz-6 kHz (approx.) | 300 Hz-3.4 kHz |
| Mic output | Varies | -- | 600 Ω | 149/±5 dB @ 1 kHz | 430 mV @ 114 dB SPL | 62 mV @ 114 dB SPL | 62 mV @ 114 dB SPL | -44/±5, 0 dB=1 V/Pa 94 dB SPL @ 6 mm |
| Speaker output | Varies | 150 Ω | 8 Ω | 102/±4.5 dB @ 1 kHz | 104 dB SPL @ 1 mW | 114 dB SPL @ 1 mW | 114 dB SPL @ 1 mW | 104 dB re 20uPa @ 1 kHz, 1 mW |
| Headband material | Varies | Overhead velcro strap, steel back band | High-impact plastic w/ rubber covers on mic | Malleable steel | Spring steel | Spring steel | Spring steel | Velcro |
| Earcup material | Varies | High-impact ABS | Clear plastic coiled tubing w/in-ear option | Rubber | High-impact ABS plastic | High-impact ABS plastic | High-impact ABS plastic | ABS |
| Colors | Black | Cobalt blue | Black | Black | Moss green | Moss green | Moss green | Black |
| Helmet compatible | Yes, varies | Yes | Yes | Yes | No | Yes | No | Yes |
| Volume adjustment | Yes | Yes | No | No | At intercom station | At utility adapter | At utility adapter | Yes |
| Sidetone | Yes | If provided by radio | If provided by radio | If provided by radio | Yes | If in radio | If in radio | Yes |
| Intrinsically safe rated | No | No | No | No | No | No | No | No |
| Amplified mic | No | Yes | No | No | Yes, amp. dynamic | In adapter | In adapter | Yes |
| Amplified gain switching | -- | No | No | No | No | No | No | No |
| Adjustable headband | Yes, varies | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Optional eartips | Yes, varies | No | No | No | No | No | No | No |
| Also acts as 2-way radio | No | No | Yes | No | No | No | No | No |
| Custom build available | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Warranty | 1 year | 2 years | 2 years | 1 year | 1 year | 1 year | 1 year | 2 years |
| Features/options | Belt harness, ext antenna, wired belt packs, more | -- | -- | -- | Opt. gel ear seals, ear seal comfort covers | Opt. gel ear seals, ear seal comfort covers | Opt. gel ear seals, ear seal comfort covers | 1.9 GHz full duplex wireless, 1,500-ft range, more |

*Key: N/A means not applicable. -- means information was not supplied. Dimensions may be rounded off.*

| MANUFACTURER→ | Firecom | Firecom | FreeLinc | FreeLinc | FreeLinc | Impact Radio Accessories | Impact Radio Accessories | Impact Radio Accessories |
|---|---|---|---|---|---|---|---|---|
| PRODUCT NAME→ | DW UH-10 | UH-10 | FreeMic 200 | FreeMotion 100 | DualMuff 300 | G1W Gold series | PBH-1 Platinum series | P2W-AT1 Platinum series |
| ↓SPECS | | | | | | | | |
| Suggested list price | -- | -- | $257 | $285 | $357 | $23-$49 | $59 | $93 |
| Type of headset | Direct wire under the helmet | Under the helmet | Wireless shoulder mic | Single ear | Dual ear | One-wire surveillance kit w/6 interchangeable ear options | Ultra light, behind the head | Two-wire surveillance kit w/disconnect acoustic tube |
| Weight | 19.6 oz. | 19.6 oz. | 4 oz. | 0.55 oz. | 16.8 oz. | 1 oz. | 3 oz. | 1 oz. |
| Power supply | 9 V thru 1K resistor | 9 V thru 1K resistor | Li-polymer rechargeable battery | Li-polymer rechargeable battery | Li-polymer rechargeable battery | Radio | Radio | Radio |
| Modes | PTT, full duplex | PTT, full duplex | PTT | PTT | PTT | Ear bud, hook; AC/tube; D-shaped ear hanger; adj. D-shaped ear hang, mini lapel speaker opt. | In-line PTT | Lapel PTT/mic |
| One or two sides | 2 | 2 | N/A | 1 | 2 | 1 | 1 | 1 |
| Noise reduction mic | 58 dB | 58 dB | -- | -- | -- | Available | Available | Available |
| Noise reduction speaker | -- | -- | -- | -- | -- | N/A | N/A | N/A |
| Type of microphone | Electret | Electret | Unidirectional | Noise canceling | Noise canceling | Electret, lapel mic | Electret, flex boom | Electret, lapel mic |
| Pivotable microphone | Yes | Yes | Yes | -- | Yes | Yes, swivel clip | Yes, gooseneck | Yes, swivel clip |
| Mic frequency response | 100 Hz-17 kHz | 100 Hz-17 kHz | 150 Hz-3.7 kHz | -- | -- | N/A | 300 Hz-3 kHz | N/A |
| Mic output | 370 mV @ 114 SPL re 0.0002 microbar | 370 mV @ 114 SPL re 0.0002 microbar | -51 dBV | -- | -- | N/A | N/A | N/A |
| Speaker output | 104 dB re 0.0002 microbar @ 1 kHz, 1 mW | 104 dB re 0.0002 microbar @ 1 kHz, 1 mW | 4 Ω @ 1.5 W | -- | -- | N/A | 5 mW | N/A |
| Headband material | Velcro | Velcro | N/A | -- | Elastic | Various | Flex metal | N/A |
| Earcup material | ABS | ABS | N/A | -- | Gel | Various | Foam | Ear bud |
| Colors | Black | Black | Black | Black | Black | Black | Black | Black |
| Helmet compatible | Yes | Yes | Yes | -- | -- | Yes | No | Yes |
| Volume adjustment | Yes | Yes | Yes | Yes | Yes | No | No | No |
| Sidetone | Yes | Yes | No | -- | -- | No | No | No |
| Intrinsically safe rated | No | No | -- | -- | -- | No | No | No |
| Amplified mic | Yes | Yes | Yes | -- | -- | No | No | No |
| Amplified gain switching | No | No | Yes | -- | -- | No | No | No |
| Adjustable headband | Yes | Yes | N/A | -- | Yes | Yes | No | No |
| Optional eartips | No | No | -- | Yes | -- | Yes | Yes | Yes |
| Also acts as 2-way radio | No | No | No | -- | -- | No | No | No |
| Custom build available | Yes | Yes | -- | -- | -- | Yes | Yes | Yes |
| Warranty | 2 years | 2 years | 1 year | 1 year | 1 year | 1 year | 1 year | 1 year |
| Features/options | Adds hearing protection to a portable radio, 24 dB NRR | Overhead, single-sided, slotted configurations avail., any configuration can be made wireless w/belt pack, 24 dB NRR | -- | -- | -- | -- | -- | -- |


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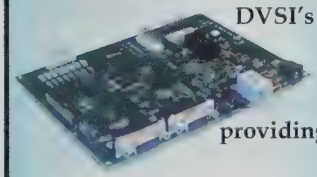

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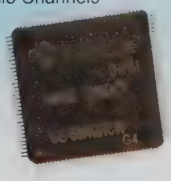

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# Headsets

| MANUFACTURER→ | JDI Jing Deng Industrial | JDI Jing Deng Industrial | Klein Electronics | Klein Electronics | Klein Electronics | Motorola | Motorola | Motorola | OTTO |
|---|---|---|---|---|---|---|---|---|---|
| PRODUCT NAME→ | HS-1 | HS-2 | Titan | Veteran | Director | Heavy duty headset for MOTOTRBO portables | Lightweight headset for MOTOTRBO portables | Temple transducer for MOTOTRBO portables | Hurricane II |
| ↓SPECS | | | | | | | | | |
| Suggested list price | -- | -- | $288 | $79.95-$89.95 | $69.95-$99.95 | $485 | $99 | $228 | $245 |
| Type of headset | Mobility | Breeze | High noise | Military-grade speaker/mic | Two-wire surveillance kit | Dual-muff heavy-duty headset | Single-muff lightweight headset | Temple transducer headset | Lightweight, dual speaker, behind the head |
| Weight | -- | -- | 8 oz. | 7 oz. | 2 oz. | 19.9 oz. | -- | 1.93 oz. (w/o cable) | -- |
| Power supply | No | No | -- | -- | -- | Radio battery | Radio battery | Radio battery | From radio |
| Modes | PTT | PTT | Earshell PTT, half duplex | Side-mounted PTT button | Sidebar PTT button, mic | PTT, VOX | PTT | PTT | Inline PTT (opt.) |
| One or two sides | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 2 | 1 |
| Noise reduction mic | -46 dB | -46 dB | 24 dB | 2K Ω impedance | -- | 24 dB | N/A | N/A | 19 dB |
| Noise reduction speaker | 110 dB | 110 dB | N/A | 8 Ω impedance | Up to 42 dB w/ comfort eartip | 24 dB | N/A | N/A | 29 dB |
| Type of microphone | Condenser | Condenser | NRR mech. boom | Unidirectional electret | Knowles dir. mic | Boom mic | Boom mic | Boom mic | Electret |
| Pivotable microphone | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Mic frequency response | -- | -- | -- | -- | -- | 100 Hz-10 kHz | -- | 300 Hz-3.3 kHz | 50 Hz-10 kHz |
| Mic output | -46 dB | -46 dB | -- | -- | -- | 39/±4 dB @ 1 kHz | -- | 44/±5 dB @ 1 kHz | -44 dBV @ 94 dB SPL |
| Speaker output | 100 mW | 5 mW | -- | 86 dB | -- | -- | -- | 97/±4.5 dB @ 1 kHz | 10 mW |
| Headband material | No | Iron, PE | Nylon w/velcro strap | N/A | N/A | Adjustable fabric | -- | Flexible steel | Lightweight metal |
| Earcup material | ABS | ABS, PC | Foam or gel | N/A | N/A | Liquid/foam ear seals | Foam ear pad | N/A | N/A |
| Colors | Black | Black | Black, carbon fiber, red | Black | Black w/clear earpiece | Black | Black | Black | N/A |
| Helmet compatible | Yes | Yes | No | Yes | Yes | Yes | No | Yes | Yes |
| Volume adjustment | No | No | -- | Yes | No | No | No | No | No |
| Sidetone | No | No | -- | -- | -- | -- | -- | -- | No |
| Intrinsically safe rated | Yes | Yes | -- | No | No | Yes | Yes | Yes | Yes |
| Amplified mic | No | No | -- | -- | No | No | No | No | N/A |
| Amplified gain switching | No | No | -- | -- | No | No | No | No | N/A |
| Adjustable headband | Yes | No | Yes | N/A | N/A | Yes | Yes | Yes | No |
| Optional eartips | Yes | Yes | No | Yes, w/opt. ear piece | Yes | No | No | No | -- |
| Also acts as 2-way radio | No | No | -- | No | No | No | No | No | No |
| Custom build available | Yes | Yes | Yes | Yes | Yes | No | No | No | -- |
| Warranty | 6 months | 6 months | 1 year | 1 year | 1 year | 1 year | 1 year | 1 year | 15 months |
| Features/options | -- | -- | Extreme noise reducing, dual PTT button, mechanical boom mic | Emergency PTT button, 3.5 mm audio port, rubber-coated grill, volume control, more | Noise-reduction mic, sidebar PTT, quick disconnect, audio tube, Kevlar-reinforced cabling | Boom mic, PTT switch on earcup | Boom mic, inline PTT, adjustable headband | Boom mic, inline PTT | Noise-attenuating plugs, more |

| MANUFACTURER→ | OTTO | OTTO | ParMarLow | ParMarLow | ParMarLow | Plantronics | Pryme Radio Products | Pryme Radio Products | Pryme Radio Products |
|---|---|---|---|---|---|---|---|---|---|
| PRODUCT NAME→ | Explorer | Breeze | HD-PWH 2100 | HD-PWH 9100 | HD-PWH 1208 | CA12CD | SPM-1500/2500 series | SPM-800 series | SPM-2400 series |
| ↓SPECS | | | | | | | | | |
| Suggested list price | $90 | $83 | -- | -- | -- | $590 | $79-$171 | $70 | $48-$80 |
| Type of headset | Lightweight, single-ear w/quick disconnect earpiece | Lightweight, behind the head w/single earphone, boom mic | Lightweight single pad | Neckband single ear | High-noise dual muff | Dispatcher cordless PTT amplifier | Throat | Helmet | Over the head |
| Weight | -- | 1.34 oz. | ±3 oz. | -- | -- | 3.7 oz. (remote unit) | 9 oz. | 8 oz. | 10 oz. |
| Power supply | From radio | From radio | N/A | N/A | N/A | 9 VDC | N/A | N/A | N/A |
| Modes | -- | In-line or remote PTT | PTT | PTT | PTT | PTT, full duplex | Tactical PTT | Full/open face | PTT, VOX |
| One or two sides | 1 | 1 | 1 | 1 | 2 | 1 or 2 | 1 | 2 | 1 |
| Noise reduction mic | N/A | N/A | 104 SPL (max.) | 104 SPL (max.) | 104 SPL (max.) | 6-18 dB | Yes | Yes | Yes |
| Noise reduction speaker | N/A | N/A | N/A | N/A | 24 dB | N/A | No | No | No |
| Type of microphone | Electret condenser | Electret | Electret, noise canceling | Electret, noise canceling | Electret, noise canceling | Noise canceling or acoustic tube | Vibration | Electret | Electret |
| Pivotable microphone | Yes | Yes | Yes | No | No | Yes | No | Yes (open face) | Yes (on boom) |
| Mic frequency response | 300 Hz-3 kHz | 300 Hz-3 kHz | 300 Hz-3 kHz | 300 Hz-3 kHz | 300 Hz-3 kHz | 300 Hz-3.5 kHz | 50 Hz-10 kHz | 50 Hz-10 kHz | 50 Hz-10 kHz |
| Mic output | -38 dBV @ 94 dB SPL | 40 dBV @ 94 dB SPL | N/A | N/A | N/A | -70 to -18 dBV | N/A | N/A | N/A |
| Speaker output | 30 mW | 5 mW | 300 mW | 300 mW | 300 mW | 80-100 dB SPL | 500 mW | 1 W | 1 W |
| Headband material | -- | Lightweight metal | Plastic/metal | PVC-coated steel | PVC-coated steel | Various | N/A | N/A | Polycarbonate |
| Earcup material | -- | Foam cushion | Cloth | Cloth | Vinyl/foam muff | Various | N/A | N/A | N/A |
| Colors | Black | Black | Black | Black | Black | Black | Black | Black | Black |
| Helmet compatible | No | No | Yes | Yes | Yes | No | Yes | Yes | No |
| Volume adjustment | No | No | No | No | No | Yes | No | No | No |
| Sidetone | No | No | No | No | No | No | No | No | No |
| Intrinsically safe rated | N/A | N/A | No | No | No | No | No | No | No |
| Amplified mic | -- | -- | N/A | N/A | N/A | Yes | Yes | No | No |
| Amplified gain switching | -- | -- | No | No | No | No | No | No | No |
| Adjustable headband | No | No | Yes | Yes | Yes | Yes | No | No | Yes |
| Optional eartips | -- | -- | No | No | No | Yes, dep. on headset | Yes | No | No |
| Also acts as 2-way radio | No | No | No | No | No | No | No | No | No |
| Custom build available | -- | -- | Yes | Yes | Yes | Yes | Yes | No | Yes |
| Warranty | 15 months | 15 months | 1 year | 1 year | 1 year | 1 year | 2 years | 1 year | 2 years |
| Features/options | Flex.-contour ear hanger, more | Extended wear in active environment, more | -- | -- | -- | -- | Acoustic or wired earphones, tactical PTT switches, quick disconnect, IP56 rates, Mil-Std-810 | Motorcycle kit w/quick disconnect, handlebar PTT assembly | Integrated tactical PTT (opt.), VOX on/off switch, 2.5-mm earphone jack |

| MANUFACTURER→ | Setcom | Setcom | Setcom | Special Electronics and Designs | Special Electronics and Designs | Special Electronics and Designs | XLT Communications | XLT Communications | XLT Communications |
|---|---|---|---|---|---|---|---|---|---|
| PRODUCT NAME→ | CSB-900R | 8B-900 | 5B | DP series | Halo | Bluetooth BT70-101 | SE-200 | TM-200 | S-300 |
| ↓SPECS | | | | | | | | | |
| Suggested list price | -- | -- | -- | Varies | Varies | Varies | $59.95 | $79.95 | $39.95 |
| Type of headset | Behind the head | Over the head | Single speaker | Noise attenuating, preamplified | From lightweight to hearing protection | Bluetooth activated, hearing protection | Surveillance two-wire | Adjustable throat mic | Small speaker mic |
| Weight | 24 oz. | 25 oz. | -- | 17 oz. | 10.9-17 oz. | 17 oz. | 1.94 oz. | 2.99 oz. | 3.88 oz. |
| Power supply | 8 VDC | 8 VDC | From radio | Radio/intercom | Rechargeable | Rechargeable | -- | 1.1-10 V | 1.1-10 V |
| Modes | PTT, full duplex intercom, half duplex radio | PTT, full duplex intercom, half duplex radio | Dep. on source | PTT | PTT/VOX | Duplex | PTT | PTT | PTT |
| One or two sides | 2 | 2 | 2 | 2 | 1 or 2 | 2 | 1 | 1 | 1 |
| Noise reduction mic | 24 dB | 24 dB | Noise canceling | 24 dB | Various, up to 24 dB | 15 dB | -34/±2 dB | -40/±3 dB | -34/±2 dB |
| Noise reduction speaker | 24 dB | 24 dB | No | N/A | N/A | N/A | 110 dB @ ±10% | 110 dB @ ±10% | 110 dB @ ±10% |
| Type of microphone | Electret | Electret | Electret | Flexible dynamic boom | Flexible electret boom or throat | Flexible electret boom | -- | -- | -- |
| Pivotable microphone | No (bends) | Yes | Yes | Yes (fully adjustable) | Yes (fully adjustable) | Yes (fully adjustable) | No | No | Yes |
| Mic frequency response | 150 Hz-5 kHz | 150 Hz-5 kHz | 150 Hz-5 kHz | 210 Hz-4 kHz | Various, up to 210 Hz-4 kHz | 100 Hz-15 kHz | 20-22 kHz | 20-22 kHz | 20-22 kHz |
| Mic output | -25/±2 dB re 1 V/PA | -25/±2 dB re 1 V/PA | -25/±2 dB re 1 V/PA | 30-56 dB gain; adj. w/R = 10 kΩ | 0-400 mV p-p | N/A | -- | -- | -- |
| Speaker output | 200 mW | 200 mW | 200 mW | 105 dB SPL w/74 dB sensitivity | 105 dB SPL w/74 dB sensitivity | 100 dB SPL | 500 mW | 300 mW | 1 W |
| Headband material | Metal/nylon | Metal | Plastic | Metal w/molded plastic and cushion | Various | Metal w/molded plastic and cushion | ABS | ABS | -- |
| Earcup material | ABS plastic | ABS plastic | Vinyl-covered foam | High-impact ABS | High-impact ABS | High-impact ABS | ABS, PU | ABS, PU | ABS, PU |
| Colors | Gray | Black | Black | Yes | Yes | Yes | Black w/clear tube | Black w/clear tube | Black |
| Helmet compatible | Yes | No | No | Yes | Yes | Yes | -- | Yes | Yes |
| Volume adjustment | Yes | Yes | Some models | Yes | No | Yes | No | No | No |
| Sidetone | Yes | Yes | Some models | No | Yes | Yes | No | No | No |
| Intrinsically safe rated | -- | -- | No | No | Yes | No | No | No | No |
| Amplified mic | Yes | Yes | Dep. on radio | Yes | Yes | No | No | No | No |
| Amplified gain switching | No | No | No | Adjustable | Adjustable | N/A | No | No | No |
| Adjustable headband | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes | No |
| Optional eartips | -- | -- | No | No | No | No | Yes | Yes | No |
| Also acts as 2-way radio | -- | -- | No | No | No | No | No | No | No |
| Custom build available | No | No | Yes | Yes | Yes | Yes | No | No | No |
| Warranty | 2 years | 2 years | 1 year | 5 years | 2 years (ltd.) | 2 years (ltd.) | 1 year | 1 year | 1 year |
| Features/options | -- | -- | -- | Lightweight, adjustable, high sound quality, more | Various earcups, mics; adjustable; more | Lightweight, adjustable, high sound quality, more | -- | -- | -- |

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# New Products

## VHF and UHF Radios

**Vertex Standard** announced the high-capacity VX-4500/4600 mobile two-way radio series that offers expanded signaling and built-in security features. The radios offer two- and five-tone encode/decode, MDC-1200 encode/decode and voice inversion encryption. Other features include channel announcement capability, emergency alert, eight-character alphanumeric display, 512-channel capacity and six programmable buttons. Frequency ranges include 134 – 174, 400 – 470 and 450 – 512 MHz with no sub-bands.

Vertex also introduced the VX-450 series of portable two-way radios that provide expanded safety and security functions. The portables feature emergency and lone worker safety alert buttons, channel announcement, 700 megawatts audio output and voice operated transmission (VOX) capabilities. Frequency ranges include 134 – 174, 400 – 470 and 450 – 512 MHz. The line offers full keypad (16 key) and four-key models, both with eight-character alphanumeric displays and 512 and 256 channel capacity respectively.

www.vertexstandard.com

## Mobiles and Portables

**Kenwood Communications** introduced three new lines of radios. The TK-7302/8302 VHF/UHF mobiles feature 16 channels, a two-digit LED display and refinements in a chassis design. The mobiles offer a programmable LED indicator, variety of signaling protocols, built-in programmable voice inversion scrambler, multiple scan functions, voice announce, wideband coverage and full compliance with Mil-Std-810 and IP54. The TK-5410 and TK-5910 Project 25 (P25)-compatible radios are 3-watt portables that operate in P25 conventional, trunking and analog conventional models, and feature 100 zones, 1,024 channels and are Mil-Std-810 C/D/E/F and IP54/55 water and dust protection rated. The TK-2360/3360 VHF/UHF conventional portables offer 5 watts transmission power, meet all military specs and IP requirements, operate in both 12.5- and 25-kilohertz bandwidths, and offer a wide UHF bandwidth of 70 megahertz.

www.kenwoodusa.com

## MOTOTRBO Radios

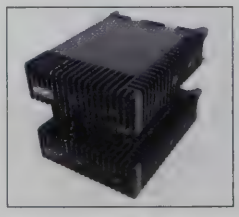
**Motorola** announced the XPR 6580 display portable analog trunked radio, the XPR 6380 nondisplay portable, the XPR 4580 display mobile and the XPR 4380 numeric display mobile. The radios operate on SmartNet and Privacy Plus analog trunking systems and are software upgradeable. Key features include dual-band functionality, operation in both 800 and 900 MHz, and the two display radios support up to 20 trunked systems and a maximum of 240 channels or trunked personalities. Motorola also announced the Dynamic Mixed Mode repeater for its MOTOTRBO system that provides users with the capability to operate a mixed fleet of analog and digital radios on the same repeater. The Transmit Interrupt Suite allows users to interrupt conversations during an emergency via the remote voice dekey and emergency voice interrupt features.

Motorola also introduced IMPRES fleet management for the company's line of two-way radio batteries and chargers. When a battery is inserted into the IMPRES charger, information is collected and shared with administrators to determine the proper action.

www.motorola.com

## P25 Vehicular Repeater

**Harris Public Safety and Professional Communications'** VRS7010 crossband vehicular repeater combines a mobile radio and a vehicular repeater for trunked communications systems using Project 25 (P25). As a repeater, the product re-transmits weak or low-level signals to extend coverage or reduce signal degradation. When operating as a mobile radio, it communicates on both P25 trunked and conventional radio systems in the 700 and 800 MHz bands. For high-security applications, optional Advanced Encryption Standard (AES) is available.



www.harris.com

## Data Capability Software

**SkyTerra** announced new radio software, developed by Hughes, that enables data capability on the MSAT-G2 mobile satellite radio equipment. The software will enable users to perform a variety of data applications including e-mail and text messaging, file transfer, remote monitoring, fleet dispatch and secure voice communications. MSAT-G2 radio equipment in the field can be upgraded with the data software through authorized service providers or dealers.

www.skyterra.com

## Dual-Head Radio Configuration

**Tait Radio Communications** released the TM9155 mobile radio from its Project 25 (P25) radio line. The radio is available with a dual-head configuration option that enables the operation of two independent, standard control heads attached to a single radio body. The user interface features, such as display content, internal speaker audio and LEDs, are duplicated on both control heads. The radio body can be located separately from the radio and only requires the installation of the standard graphical head at the user location.

Tait also introduced the TP9100 vehicle charger for portables, designed for fixed installation in vehicles to provide

reliable and fast charging to either the battery alone or battery with the radio. The charger is compatible with Li-ion or NiMH batteries and features a single action to latch and release a radio from the charger.
www.taitworld.com

## IP Data Radio and Router

The Phantom II from **CalAmp** is a highly secure, frequency hopping IP data radio for the license-free 902 – 928 MHz industrial, scientific and medical (ISM) band. The radio delivers throughput speeds of up to 1.4 Megabits per second (Mbps) over long ranges that can exceed 30 miles in line-of-sight applications. With a

compact profile, low-power consumption modes and adjustable transmission power, the software-based platform is field configurable as an access point, a remote radio or a wireless repeater. The platform also supports single radio store-and-forward operation, full virtual LAN (VLAN) support and Advanced Encryption Standard (AES) 128/256 encryption capabilities.

CalAmp also introduced the Viper-200 wireless Ethernet/IP router that works as a bridge for high-speed, high-power licensed operations in the 216 – 222 MHz band. The router offers a power output to 10 watts, data rates up to 128 kilobits per second (kbps) and full router and bridge capability. The radio offers multiple encryption protocols and supports both point-to-point and point-to-multipoint network configuration.
www.calamp.com

## VHF Data Modem

The VHF M7 data radio modem from **Raveon Technologies** works in the 136 – 174 MHz band and is compliant with FCC Parts 22 and 90. The modem is

ideal for radio telemetry, supervisory control and data acquisition (SCADA) and AVL applications and meets FCC refarming, spectral efficiency and narrowbanding requirements. The modem features up to 5 watts of RF output, communications range of up to 60 miles, 5 milliseconds transmission-receive switching time for telemetry systems, remote diagnostics and programmable over-the-air data rates of 1.2 – 9.6 kilobits per second (kbps).
www.raveontech.com

## Tone Remote Controller and Scrambler

The TRC-700 tone remote controller with pulse tone (1.5 or 2.805 kHz) encode and decode capabilities from **Midian Electronics** is for Hospital Emergency Administrative Radio (HEAR) systems. An ambulance can selectively call the controller at the hospital to alert staff of

an emergency. Midian's UED-1B-DMV can be installed in the ambulance to dial the pulse tone. Different microphone configurations are available.

Midian also released voice scramblers for Kenwood's NEXEDGE portable and mobile radios in analog mode. The VS-1200-KW3 is for high-level frequency domain, the VS-1000-KW3 is a multi-code voice inversion and the VS-1050-KW3 is a voice inversion with automatic number identification (ANI). The VS-1200-KW3 and VS-1050-KW3 also support ANI in Motorola's MDC-1200, Kenwood's FleetSync, Harris' GE-Star, DTMF and five-tone.
www.midians.com

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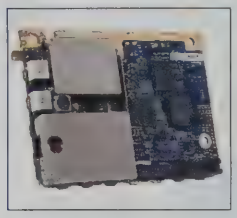
## UHF Data Link

**Pacific Crest** unveiled the ADL RXO, an advanced data link (ADL) that works as a receive-only UHF radio designed for easy integration for products that require a low-power one-way radio communications link. The link is backward compatible with existing Pacific Crest, Trimble and other global navigation satellite



system/real time kinematic (GNSS/RTK) positioning products, allowing rapid integration into RTK survey, machine control and environmental monitoring systems. The link is available in two 40-megahertz frequency bands (390 – 430 and 430 – 470 MHz) and allows users to select from available channel tables in either 12.5- or 25-kilohertz channel bandwidths. Its next-generation RF design offers higher bit rates to easily handle RTK corrections for the current and expanding GNSS satellite constellations, company officials said.
www.pacificcrest.com

## Narrowband System Analyzer

New digital narrowband test capabilities have been added to the **General Dynamics Satcom Technologies** R8000 communications system analyzer. New testing capabilities include NXDN, expanded digital mobile radio (DMR)/MOTOTRBO functionality and POCSAG paging. The NXDN option includes a comprehensive test suite for the NXDN 6.25-kilohertz FDMA digital narrowband protocol and includes bit error rate (BER) measurement capability, eye diagrams for quick visual signal quality tests, full battery of parametric tests and voice loopback test.
www.gdsatcom.com

## Antenna Mount

**Royal Communications International** introduced the Swing-A-Way Antenna Mount (SWAM) removable antenna

mount. The universal mounting system was designed for canister-style antenna tuners like the Micom or Codan HF-SSB automatic whip antennas. The product mounts in a standard 2-inch receiver-style hitch, includes grounding strap and allows for full access to the rear of the vehicle in the open position. The mount features a power-coated box steel design for maximum strength and durability, company officials said.
www.royal-communications.com

## Power over Ethernet Device

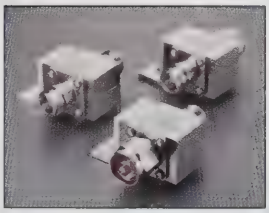
**Carlson Wireless Technologies** integrated a new Power over Ethernet (PoE) device into its solar-powered wireless product line. The PoE unit increases system efficiency by up to 45 percent, and reduces the required solar panel size and eliminates the need for costly inverters, company officials said. Designed for remote locations, the company's Trailblazer and LongHaul microwave backhaul radios integrate with the solar power kits, directly monitoring both radio and solar equipment via data throughput, temperature and voltage readings and sending e-mail alerts at user-set thresholds to communicate problems before failure occurs.
www.carlsonwireless.com

## Transmitter Combiner

**Bird Technologies Group, TX RX Systems** introduced the 700/800 MHz ceramic transmitter combiner. The system is the product line evolution that began with the UHF combiner. The combiner can accommodate multiple, high-power channels using minimal rack space through the compact, cost-effective ceramic-based design.
www.bird-technologies.com

## Lightning Protection

**Times Microwave Systems** unveiled the LP-BTR50 series as part of the Times-Protect line of RF lightning and surge protection products. The product provides protection of RF equipment for applications from 125 MHz – 1 GHz. Features include direct current (DC) blocking technology, longevity, multistrike performance, S parameters over the operating band and surge performance.
www.timesmicrowave.com



## Microphones

**Astra Radio Communications (ARC)** introduced several new microphones. The B45 is an anti-noise earbone microphone earpiece that transmits voice and audio by integrating voice pickup and voice transmission. The two-wire mic is ideal for people communicating in loud environments who need their hands free, ARC executives said. The S14 waterproof speaker microphone is a medium-duty mic that can withstand wet environments. The light-duty S10NC and two-wire T23NC noise-canceling microphones block surrounding noise. All microphones are made with polycarbonate plastic, Kevlar-reinforced cabling and can be used with most two-way radio brands, executives said.
www.arcmics.com

## In-Ear Audio System

**CeoTronics** announced the CT Digital Clipcom, an in-ear audio system for Special Weapons and Tactics (SWAT) and tactical operations. The system provides users with certified noise attenuation of


# Radio Remote Control

**Now for NX700/NX800**

CPI's **TRML Multi-Line tone remote** allows users access to 4 different radios and is a feature packed small console.

CPI's MCR/TSR multi-channel systems control many popular Kenwood and Motorola radios. Included is the Kenwood TK5710 P25, TK 7150/8150, 7180/8180, -90 series, and **NX700/800** mobiles. The Motorola series includes the CDM1550 and CM300 mobile radios.

**CPI manufactures a complete line of DC, Tone, Local Extension, Multi-Channel, and Multi-Line remotes and termination panels for most radio systems. For additional information on the complete line of CPI products please call our visit our website.**

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Fax: (972) 429-7165
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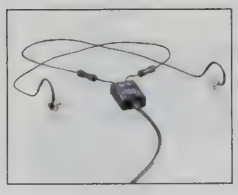
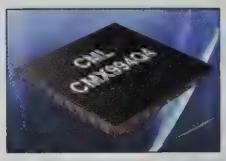


26 dB and provides for ambient sound reception. Using the company's Silicone ear molds for comfort, the system has been field tested for 12-hour operation without wearing discomfort. The product is a certified personal protection equipment (PPE) that is helmet independent and adaptable to most tactical vests.
www.ceotronicsusa.com

### SDR RF Circuit

The CMX994 from **CML Microcircuits** is a direct conversion receiver IC (DCRx) that targets the next-generation of multi-mode software-defined radios (SDR) for wireless data and two-way radio applications.



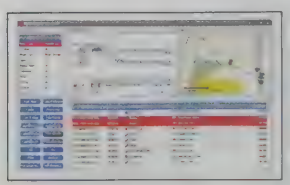

The DCRx mixes the wanted RF signal down to 0 hertz in a single quadrature mixing process using a local oscillator tuned to the wanted RF channel frequency. Selectivity filtering and gain can now take place at baseband with practical, low power, analog and digital circuits, company officials said. Features include on-chip voltage-controlled oscillator (VCO) for VHF applications, an operating range of 100 MHz to 1 GHz and precision baseband filtering with selectable bandwidths. The receiver operates at 3 – 3.6 volts and comes in a Q4 40 very thin quad flat non-leaded (VQFN) package.
www.cmlmicro.com

### Vertex Standard Replacement Battery

**BatteryJack** manufactured a replacement battery for the Vertex Standard VX160/180 radio lines. The intrinsically safe battery exceeds the original equipment manufacturer (OEM) requirements in prevention of excessive heat buildup and is compatible with intrinsic safety Class I, II and III and Groups C, D, E, F and G. Internal thermal fuses monitor the battery cells, and the 7.5-volt battery is produced with Sanyo NiMH cells.
www.batteryjack.com

### Audio and Data Recording Software

**HigherGround** launched the next generation of public safety answering point (PSAP) software with the release of NextGen Capture911 software. The system offers feature-rich audio and data recording to meet existing and future requirements of emergency responder protocols, company officials said. Using a modular approach, the system can range from basic to the ability to collect and consolidate diverse



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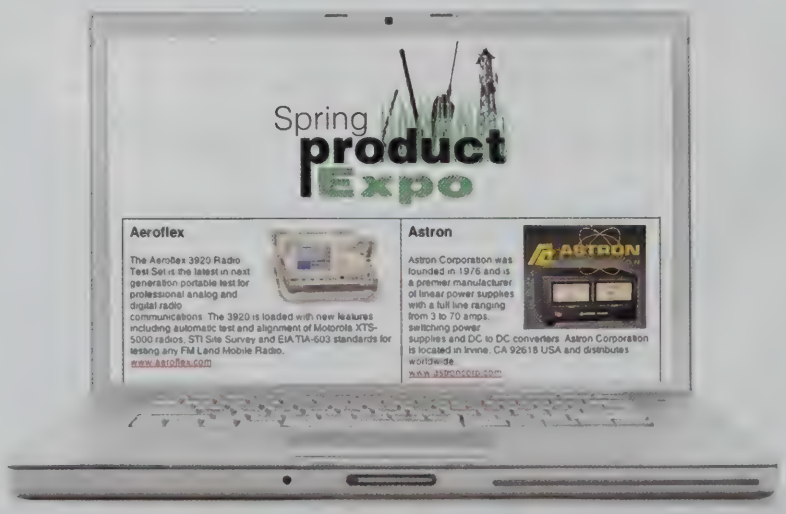
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www.aeroflex.com
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multimedia data from disparate sources into a single platform. The software collects data and presents it in a chronological manner and can re-create entire incidents, including mapping.
www.capture911.com

## Dispatcher Software

**C4i** announced new features to improve dispatcher ease of use, system flexibility and first responder access with the latest Switch*plus*IP release 2.2. Building off the system's flexibility with true free seating and fully integrated telephony, the new release adds capability for radio users to dial specific dispatchers and telephone extensions. Other features include the ability to integrate with low-cost PC, operator control unit (OCU); independent audio for two headsets, speakers, handset and voice recorder operator interface unit (OIU); integrated IP video camera into dispatch position; and no single point of failure.
www.c4i.com

## Disaster-Exercise Software

The Avalanche TTX from **Avalias** is scenario-based collaboration software for comprehensive disaster readiness discussion exercises. The software lets incident responders across multiple agencies create and coordinate highly realistic and complex disaster scenarios that present an array of urgent challenges. The real-time, multimedia software helps identify bottlenecks, interagency coordination problems, distractions, resource shortages and other factors likely to evolve during events, Avalias executives said.
www.avalias.com

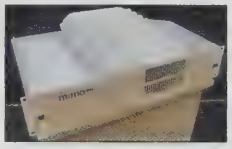
## Refurbished Toughbook

**Toughbook Depot's** Tough Test allows users to watch while field professionals throw baseballs as hard as they can to try and knock out the refurbished Toughbook laptops. The test was developed to

show that there is no risk when buying the company's factory authorized refurbs. A no-risk policy means every unit meets or exceeds factory standards and is backed by the Beyond Process, which includes a final inspection, service, and hard-to-find parts and accessories, company officials said.
www.toughbookdepot.com/rre

## Remote Site Link

The **MiMOMax Wireless** Power OnDemand Link (M-PoD) for supporting remote sites was designed for the low latency and



spectrally efficient Network Digital Link (NDL). The link reduces power consumption by automatically and rapidly turning the remote end of a link's transmitter on and off, depending on the demand for over-the-air traffic. IP and NIM data at either end will prompt the link to activate, and when the link isn't in use, the link power consumption is reduced to less than 10 watts.
www.mimomax.com

## Tower Software

Inspectower 3 from **Guymast** is software designed to make tower reports easier by performing calculations, creating tables for reports, creating drawings required for mandatory mapping assignments and keeping track of projects. Users can enter data, produce drawings, create inspection tables, add comments and print reports all in less than an hour, company executives said.
www.guymast.com

## Wearable Video System

**Digital Ally** began production on the FirstVu professional wearable video sys-

tem. The system is a compact digital video/audio recorder and digital photographic camera that was designed to capture hands-free evidence. Key features include vibrating notification, infra-red illumination, still image capability, password protection, high-resolution video, wide-angle camera view and back office video management software.
www.digitalallyinc.com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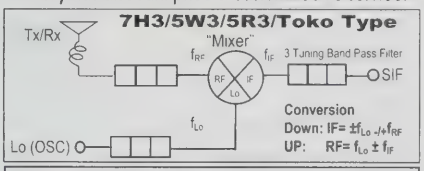


### FM IF Helical Band Pass Filter 7H3 (Triple Tunning) RL>16

| TW-P/N-Fo | Fo / B.W / IL MHz/MHz/dB | TW-P/N-Fo | Fo / B.W / IL MHz/MHz/dB |
|---|---|---|---|
| TT67626B-60M | 60 / 4.0 / 4.0 | TT67693B-101M | 101 / 8.0 / 3.5 |
| TT67487B-70M | 70 / 9.0 / 3.0 | TT67181B1-128M | 128 / 23.0 / 1.5 |
| TT67425A-71M | 71 / 15.0 / 2.5 | TT6756B-140M | 140 / 3.0 / 7.5 |
| TT67114D-90M | 90 / 2.0 / 6.0 | TT6755D1-140M | 140 / 5.0 / 3.5 |
| TT67192B-90M | 90 / 6.0 / 3.0 | TT67676B-140M | 140 / 8.0 / 3.0 |
| TT6388B1-98M | 98 / 22.0 / 2.0 | TT67205B-140M | 140 / 10.0 / 3.0 |

### Temwell Type VHF 138-260MHz Band Pass Filter 7H2/7H3 RL>16

| TW-P/N-Fo | Fo / B.W / IL MHz/MHz/dB | TW-P/N-Fo | Fo / B.W / IL MHz/MHz/dB |
|---|---|---|---|
| TT67194B-140M | 140 / 9.0 / 3.0 | TT67677B1-140M | 140 / 13.0 / 3.0 |
| TT67281B-160M | 160 / 8.0 / 2.5 | TT67711B-160M | 160 / 10.0 / 3.0 |
| TT6730B-180M | 180 / 6.0 / 2.5 | TT67183B1-180M | 180 / 12.0 / 2.5 |
| TT6732B-200M | 200 / 8.0 / 3.0 | TT6761B-200M | 200 / 11.0 / 3.5 |
| TT6732B-220M | 220 / 8.0 / 3.0 | TT6761B-220M | 220 / 11.0 / 3.5 |
| TT6734B-240M | 240 / 8.0 / 2.5 | TT6763B-240M | 240 / 12.0 / 3.0 |
| TT6737B-260M | 260 / 10.0 / 2.5 | TT6764B-260M | 260 / 12.0 / 3.0 |

### Temwell Toko Type (7H2/7H3) (Double/Triple Tunning) RL>16

| TW-P/N-Fo-BW | TW-P/N-Fo-BW | TW-P/N-Fo-BW | TW-P/N-Fo-BW |
|---|---|---|---|
| K2B1-360M-10M | K2B1-505M-13M | K3BT-435M-20M | K3CT1-833M-21M |
| K2B1-370M-10M | K2B1-525M-13M | K3BT-455M-20M | K3BT-835M-20M |
| K2B1-380M-10M | K3BT-370M-10M | K3BT-465M-15M | K3CT1-860.5M-23M |
| K2B1-390M-10M | K3BT-370M-16M | K3B-485M-20M | K3BT-880M-25M |
| K2B1-410M-10M | K3BT-390M-10M | K3BT-510M-15M | K3CT1-904M-12M |
| K2B1-420M-11M | K3BT-390M-16M | K3BT-500M-16M | K3CT1-915M-12M |
| K2B1-435M-11M | K3BT-410M-11M | K3CT2-600M-20M | K3CT1-938M-15M |
| K2B1-450M-11M | K3BT-410M-16M | K3BT-612M-18M | K3CT1-947M-18M |
| K2B1-460M-11M | K3BT-415M-16M | K3CT2-651M-10M | K3CT1-960M-12M |
| K2B1-475M-11M | K3BT-415M-20M | K3BT-680M-13M | K3CT1-1015M-25M |
| K2B1-490M-13M | K3BT-425M-20M | K3CT1-833M-16M | |

### Temwell Toko Type (5R2/5R3) (Double/Triple Tunning) RL>16

| TW-P/N-Fo-BW | TW-P/N-Fo-BW | TW-P/N-Fo-BW | TW-P/N-Fo-BW |
|---|---|---|---|
| K2RB-320M-10M | K2RB-820M-20M | K3RFT-390M-20M | K3RBT-590M-18M |
| K2RB-340M-10M | K2RB-862M-21M | K3RFT-400M-15M | K3RBT-635M-18M |
| K2RB-365M-10M | K2RB-880M-20M | K3RFT-410M-15M | K3RBT-655M-16M |
| K2RB-380M-10M | K2RB-914M-25M | K3RFT-410.7M-10M | K3RBT-705M-20M |
| K2RB-415M-10M | K2RB-959M-25M | K3RFT-420M-16M | K3RBT-735M-20M |
| K2RB-425M-10M | K2RB-1010M-26M | K3RFT-430M-18M | K3RBT-800M-20M |
| K2RB-430M-10M | K2RB-1130M-26M | K3RFT-435M-10M | K3RBT-830M-20M |
| K2RB-450M-11M | K2RC-1195M-35M | K3RFT-440M-18M | K3RBT-862M-20M |
| K2RB-475M-11M | K2RC-1225M-35M | K3RFT-450M-18M | K3RBT-880M-20M |
| K2RB-474M-11M | K2RC-1305M-35M | K3RFT-460M-18M | K3RBT-945M-20M |
| K2RB-505M-14M | K3RFT-320M-20M | K3RFT-470M-18M | K3RBT-980M-20M |
| K2RB-530M-14M | K3RFT-340M-20M | K3RFT-480M-18M | K3RBT-1010M-20M |
| K2RB-545M-14M | K3RFT-350M-20M | K3RFT-495M-20M | K3RBT-1055M-20M |
| K2RB-625M-14M | K3RFT-360M-20M | K3RFT-515M-20M | K3RBT-1090M-20M |
| K2RB-670M-20M | K3RFT-370M-20M | K3RFT-518M-20M | K3RCT3-1125M-20M |
| K2RB-700M-20M | K3RFT-380M-20M | K3RBT-520M-14M | K3RCT3-1230M-20M |
| K2RB-735M-20M | -- See 3000 Perf on"www.temwell.com" -- | | |

### UHF Helical Band Pass Filter 5W3 (Triple Tunning) RL>16

| TW-P/N-Fo-BW | TW-P/N-Fo-BW | TW-P/N-Fo-BW |
|---|---|---|
| TTW3489B-713M-14M | TTW3537F-1441M-34M | TTW3608B-2400M-100M |
| TTW3489B-743M-17M | TTW3536B-1489M-43M | TTW3536B-2450M-95M |
| TTW3512B-815M-35M | TTW3539E-1489M-34M | TTW3859B-2450M-100M |
| TTW3513B-850M-33M | TTW3588B-1575M-40M | TTW3840B-2450M-175M |
| TTW3739B-1275M-50M | TTW3527F-1747.5M-69M | TTW3841B-2500M-190M |
| TTW3810B-1375M-72M | TTW3529E-1842.5M-70M | TTW3875B-2583M-140M |

### VHF UHF Band of Band Pass Filter 7H3 (Triple Tunning) RL>16

| TW-P/N-Fo-BW | TW-P/N-Fo-BW | TW-P/N-Fo-BW | TW-P/N-Fo-BW |
|---|---|---|---|
| TT63228B-288M-80M | TT6393F-530M-120M | TT63337F-725M-120M | TT67868B-933M-140M |
| TT63348B-375M-100M | TT67155F-575M-120M | TT63348F-805M-140M | TT67862B-975M-120M |
| TT6395F-450M-120M | TT67618F-625M-130M | TT63353E-900M-165M | TT67864B-1075M-120M |
| TT63355F-480M-120M | TT63333F-666M-135M | TT67861B-925M-120M | TT63362F-1300M-200M |

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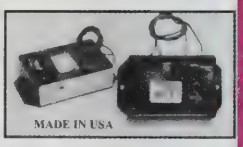


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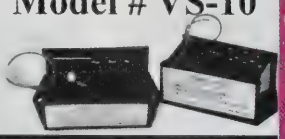

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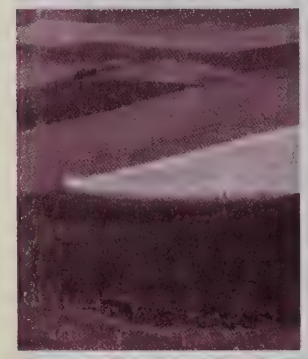

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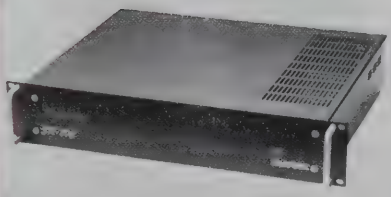

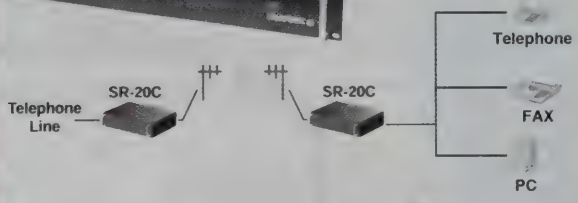


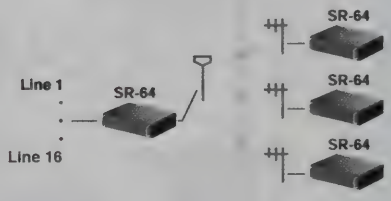


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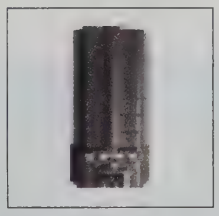

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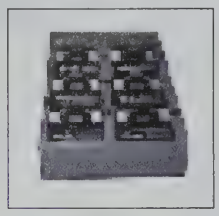

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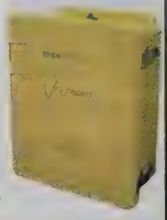

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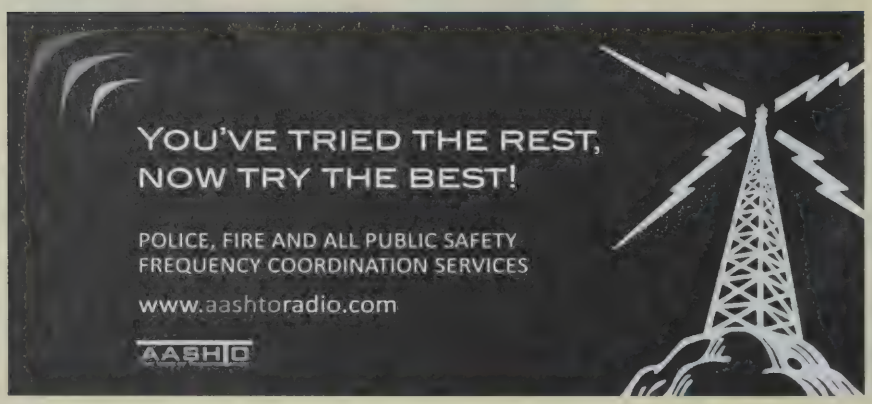

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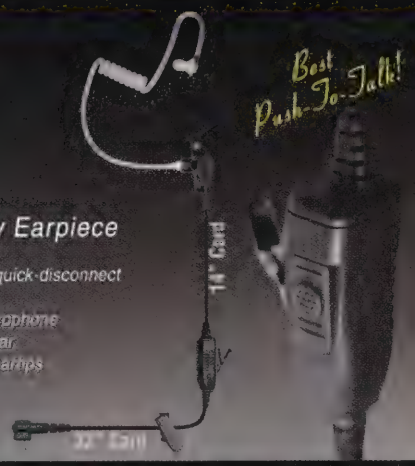


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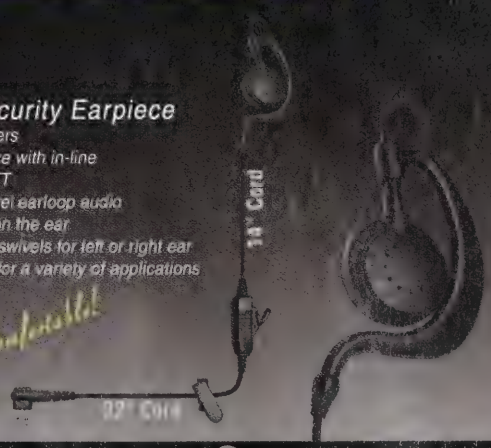


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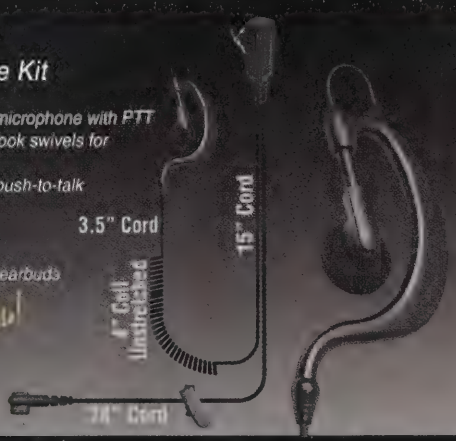


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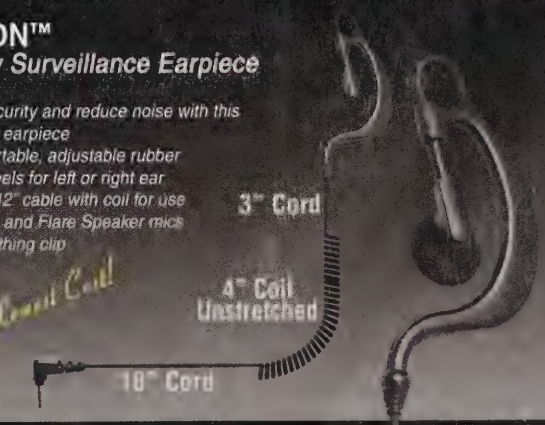


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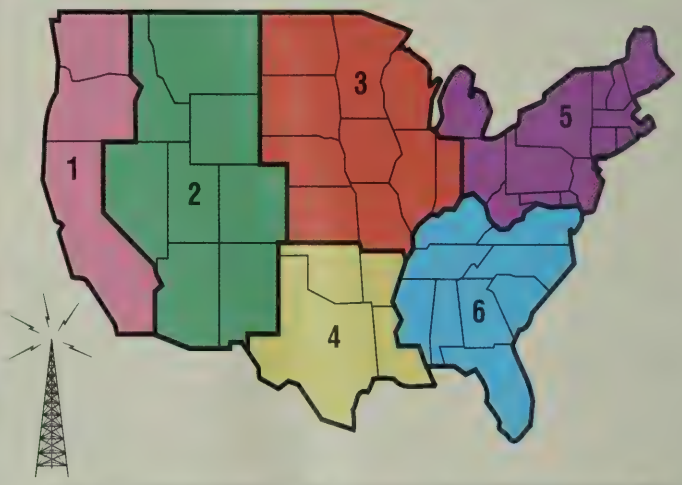


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| Richmond | 200ft | 37-33-32N | 77-24-32W |
| Portsmouth | 480ft | 36-51-39.5N | 76-21-11.7W |
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# Events

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**May 17 – 19: RSSI C&S Exhibition**, Omaha, Neb. Railway Systems Suppliers Inc. (RSSI): 502-327-7774, rssi@rssi.org, www.rssi.org/2010_exhibit

**May 18: Public Safety Communications Leadership in Policy Awards Dinner**, Washington. APCO International: 888-272-6911 (APCO911), http://leadersdinner2010.apcointl.org/

**May 23 – 26: UTC Telecom 2010**, Indianapolis. Utilities Telecom Council (UTC): 202-872-0030, meetings@utc.org, www.utctelecom2010.utc.org

**May 24 – 26: Border Management Summit Southwest**, Tucson, Ariz. Institute for Defense and Government Advancement (IDGA): 973-256-0211, info@idga.com, www.bordermanagementsummit.com

**May 24 – 27: IACP Law Enforcement Information Management (LEIM) Section Training Conference and Expo**, Atlanta. International Association of Chiefs of Police (IACP): leim2010conference@theiacp.org, www.theiacp.org

**May 25 – 27: TETRA World Congress 2010**, Singapore. TETRA World Congress: enquiries@tetraworldcongress.com, www.tetraworldcongress.com

**June 2 – 4: Wireless @ Virginia Tech**, Blacksburg, Va. Virginia Tech: 540-231-2971, www.wireless.vt.edu

**June 5 – 10: NENA 2010: 9-1-1 Conference and Trade Show**, Indianapolis. National Emergency Number Association (NENA): 703-812-4600, www.nena.org/NENA2010

**June 22 – 23: Police Security Expo**, Atlantic City, N.J. Police Security: 800-323-1927, webmaster@police-security.com, www.police-security.com

**June 26 – 30: National Sheriffs' Association (NSA) Annual Conference**, Anaheim, Calif. NSA: 703-838-5321, www.sheriffs.org

**August 1 – 4: APCO 76th Annual Conference and Trade Show**, Houston. APCO International: 888-272-6911, www.apco2010.org

**August 24 – 28: Fire-Rescue International (FRI) 2010**, Chicago. International Association of Fire Chiefs (IAFC): 703-537-4840, www.iafc.org/fri

**September 27 – 30: Canadian Utility Telecom Conference**, Saskatoon, Saskatchewan. UTC Canada: 202-872-0030, www.utccanada.org

**October 4 – 6: FCCA Annual Meeting**, Orlando, Fla. FCCA: 717-338-1505, ed@fcca-usa.org, www.fcca-usa.org

**October 4 – 7: PCIA Wireless Infrastructure Show**, Hollywood, Fla. PCIA: 703-535-7411, events@pcia.com, www.wirelessinfrastructureshow.com

**October 23 – 27: IACP Annual Conference**, Orlando, Fla. International Association of Chiefs of Police (IACP): 703-836-6767, www.theiacp.org

**November 3 – 5: Enterprise Wireless 2010**, Orlando, Fla. Enterprise Wireless Alliance (EWA): 520-620-0063, elaine@ecommint.com, www.enterprisewireless.org

**November 7 – 10: Communications Marketing Conference (CMC)**, Nashville, Tenn. Communications Marketing Association (CMA): 303-988-3515, www.cma-cmc.org/conference.php

**November 15 – 18: APCO Canada**, Vancouver, British Columbia. APCO Canada: www.apcocanadaconference.ca

**December 5 – 8: Fourth Canadian Public Safety Interoperability Workshop**, Victoria, British Columbia. Canadian Interoperability Technology Interest Group: www.citig.ca

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By Sandra Wendelken, Editor

# Midwest Network Targets Public-Safety Agencies

Mike Miller is the president of RACOM, which provides mission-critical voice and data services to the public-safety industry in the upper Midwest. RACOM is in its 38th year and has 75 employees.

**Mike Miller**
**Company:** RACOM
**Title:** President
**Where:** Marshalltown, Iowa
**Years of Industry Experience:** 14
**Number of Staff:** 75
**Web Site:** www.racom.net

### What is the most important development in communications during the past few years?

Nailing down just one is difficult. I think the following are most significant:

■ Narrowbanding. While lots of public-safety agencies are working toward making their systems narrowband compliant, I am continually amazed at the large numbers that aren't doing anything yet.

■ Project 25 (P25). As our public-safety trunked standard "gets real," more of our business is P25 related. Narrowbanding, in part, is driving people to P25.

■ Manufacturer End of Life. The major manufacturers of public-safety trunking platforms (Harris and Motorola) have begun the end-of-life process for their proprietary trunked formats, which has led to an even faster move to P25 technology.

### How does your communications network benefit your customers daily and during a crisis?

Our company owns and operates the RACOM Network, a 100-site 800 MHz trunking network based on Harris' EDACS technology that serves as the communications platform for nearly 300 municipal, county, state, and federal public-safety and public-service agencies throughout the upper Midwest and handles more than 1 million calls per day. Our customers benefit by having more communications interoperability, coverage and radio capabilities than they could afford on their own, which in a crisis can be critical.

### What is the most significant mission-critical communications policy on the horizon?

While there has certainly been lots of hype (and hype alone) to this point, we believe that the end result of the 700 MHz D block proceedings has the potential to shape the voice and data industry for public safety from here forward.

### What completed project are you most proud of?

The daily service we provide to the communities we serve makes us proud and is rewarding. At RACOM we engineer, sell and maintain nearly all of the equipment related to the second half of the 9-1-1 response — everything from the time a 9-1-1 dispatcher answers the phone to the time an emergency responder arrives on scene. Making sure that half of the 9-1-1 response is even more reliable than the initial call to 9-1-1 is something that we feel a great responsibility for and derive deep pride in being able to provide consistently and reliably.

### Is there a shortage of qualified RF engineers?

In general, I think the slowing of the economy has helped find good people. Having said that, there are still too few people who have great RF skills and great IP networking skills. The people with both skills are hard to come by and quite valuable in our industry.

### How did you get your start in the mobile communications industry?

RACOM is a family company that was started by my father, Gregg Miller, in 1972. My first job in the industry was pretty meager; I was the janitor at RACOM.

### What would you be doing if you didn't have your current job?

I really enjoy what we do at RACOM and what I get to do here. I can't imagine doing something different. But if I had my choice of anything, I might be a farmer in Napa, Calif., trying to make great red wine. ■

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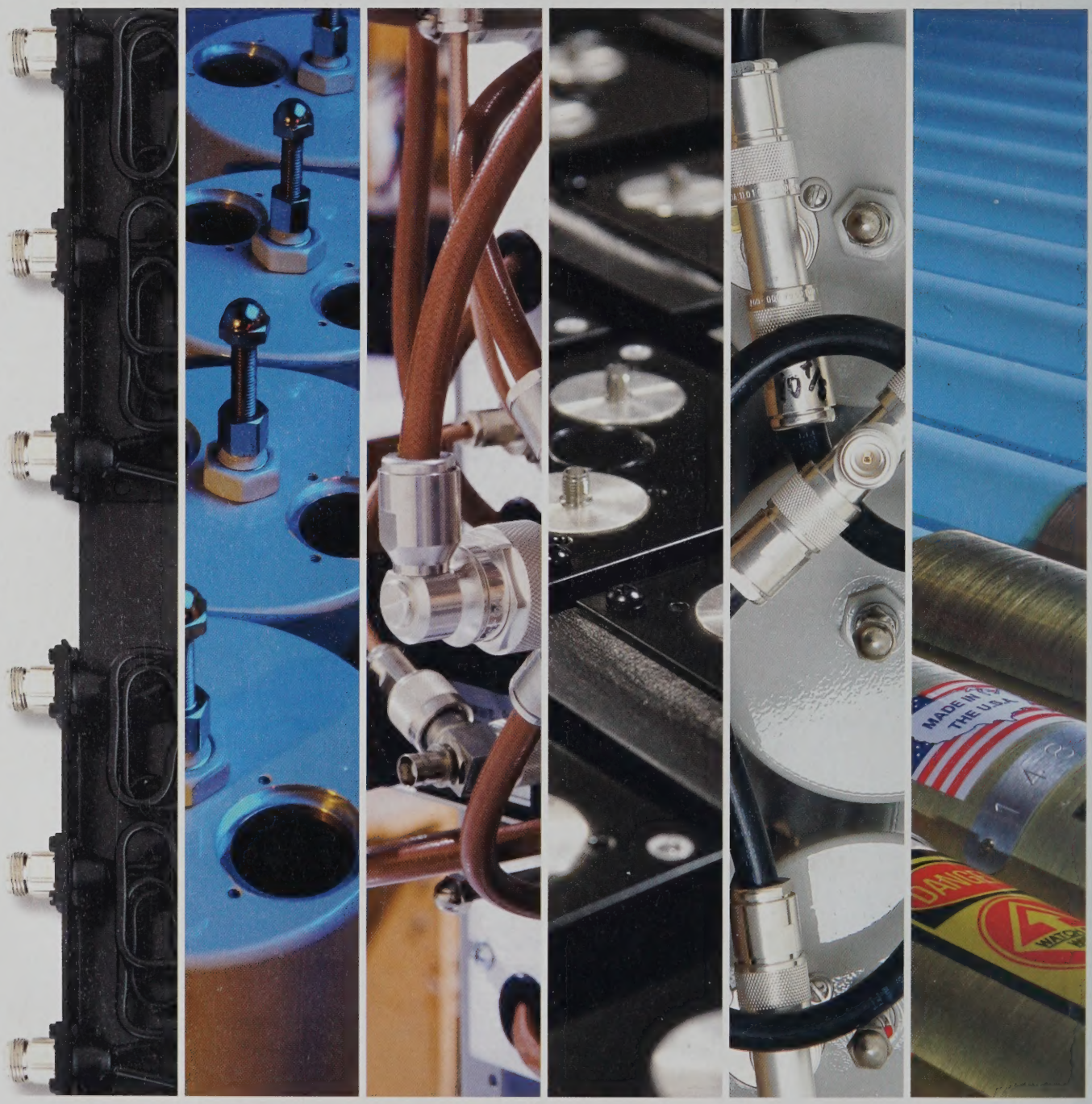


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